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USAAVLABS TECHNICAL REPORT 69-89

REFINEMENT OF REJECT CRITERIA FOR UH-1 SONIC ANALYZER

By

W. H. Dawson

December 1969

U. S. ARMY AVIATION MATERIEL LABORATORIES
FORT EUSTIS, VIRGINIA

CONTRACT DAAJ02-69-C-0041
CURTISS-WRIGHT CORPORATION
AEROSPACE EQUIPMENT DIVISION
CALDWELL, NEW JERSEY

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DEPARTMENT OF THE ARMY
HEADQUARTERS US ARMY AVIATION MATERIEL LABORATORIES
FORT EUSTIS, VIRGINIA 23604

This report was prepared by the Curtiss-Wright Corporation under the terms of Contract DAAJ02-69-C-0041. It consists of a review and refinement of the data collected with the Curtiss-Wright Sonic Analyzer on the UH-1 helicopter during 1967 and 1968.

The object of this contractual effort was to refine the UH-1 helicopter sonic analyzer limits that had previously been established. The refined limits are presently being used in a USAAVLABS in-house investigation conducted at Fort Stewart-Hunter Army Airfield. The accuracy of the refined limits and of the sonic analysis technique will be established.

The conclusions and recommendations contained herein are concurred in by this Command.

Task 1F162203A43405
Contract DAAJ02-69-C-0041
USAAVLABS Technical Report 69-89
December 1969

REFINEMENT OF REJECT CRITERIA FOR UH-1 SONIC ANALYZER

Final Report

C-3068

By

W. H. Dawson

Prepared by

Curtiss-Wright Corporation
Aerospace Equipment Division
Caldwell, New Jersey

for

U. S. ARMY AVIATION MATERIEL LABORATORIES
FORT EUSTIS, VIRGINIA

SUMMARY

The purpose of this program was to employ additional data to update the original UH-1 aircraft sonic analyzer limits and to determine the advisability of using a common checking engine speed for all models.

The method involved a full engineering analysis of the original 1967 data plus an approximately equal amount of data obtained on UH-1 helicopters at Fort Eustis, Virginia, in 1968.

Emphasis was placed on selected transmission and tail rotor components, including the primary drive gears.

The work consisted of deleting invalid or questionable data by detailed investigation of component inspection records, maintenance records, rpm locking information, playbacks of recorded data, contradictory data, etc., in an effort to assure that only valid representative data was used for limits determination.

The need for two test tapes to handle all the various models of the UH-1 helicopter evolved from the analysis. The result is sonic analyzer limits for the UH-1 helicopter which should demand considerable respect as to the condition of the aircraft components. Any readings that exceed these limits in the future should not be passed off lightly, but rather should be seriously considered and investigated thoroughly.

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LIST OF SYMBOLS

ADGB	Accessory drive gearbox
Brg	Bearing
C_1	1st stage compressor rotor
C_2	2nd stage compressor rotor
c.p.s.	Cycles per second
d_1	Bearing inner race diameter, inches
d_2	Bearing outer race diameter, inches
d_B	Bearing rolling element diameter, inches
Eng	Engine
f_1	Bearing frequency caused by irregularity on inner raceway, c.p.s.
f_2	Bearing frequency caused by irregularity on outer raceway, c.p.s.
f_B	Bearing frequency caused by spin of rolling element, c.p.s.
f_B'	Bearing frequency caused by rough spot on rolling element, c.p.s.
$3f_B'$	Third harmonic of f_B' (3 times f_B'), c.p.s.
f_R	Fundamental rotational frequency of engine, gear shaft, or bearing shaft, c.p.s.
f_T	Bearing frequency due to rotation of train of rolling elements, c.p.s.
f	Frequency, c.p.s.
FRG	Frequency ratio generator
FWD	Forward
Gen	Generator
Gov	Governor

LIST OF SYMBOLS - Continued

Hyd	Hydraulic
I.D.	Inside diameter, inches
KC	Kilocycles
m	Number of bearing rolling elements
MRC	Marlin-Rockwell Company
Mic	Microphone
Min	Minimum
N	Revolutions per minute
N_1	Gas producer rotor speed, rpm
N_2	Power turbine rotor speed, rpm
ND	New Departure
NH	Norma Hoffman Bearing Company
No.	Number
O.D.	Outside diameter, inches
OUPT	Output
OVSP	Overspeed
P/N	Part number
Ref	Reference
RPM, rpm	Revolutions per minute
rps	Revolutions per second
SHP	Shaft horsepower
SKF	SKF Industries, Inc.
Tach	Tachometer
T/O	Takeoff
XMSN	Transmission

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INTRODUCTION

For brevity, this report will frequently refer to Report 68-28.*

In addition to preliminary limits, Report 68-28 contains complete information on the design and use of the sonic analyzer, mechanical information for various models of the UH-1 aircraft, component frequencies, sample calculations, etc., and hence is referenced in this report to avoid repetition.

The sonic analyzer monitors similar component assemblies (gear trains, transmissions, etc.) for all mechanical devices. Because of this, criteria used in earlier programs can be used to estimate preliminary limits for a particular model aircraft before any (or little) empirical test data are obtained on this particular aircraft. This procedure was used for the UH-1 helicopter sonic analyzer program. Report 68-28 sets forth these estimated limits and provides some preliminary modifications based on early (1967) test data, mainly on the B model helicopter.

Also, the initial list of components to be checked is made "all engulfing". As empirical experience is gained on maintenance and inspection procedures, habitually troublesome components, component sonic characteristics, general noise levels, etc., the list is usually rearranged to put only the selected components on a single list and most of the remainder on separate list(s). Report 68-28 accomplishes this as set forth in tapes 109, 110 and 111.

Since Report 68-28, considerable additional data have been obtained on both the UH-1B and UH-1D model helicopters at Fort Eustis, Virginia, during 1968.

It is the purpose of this report to combine the experience and data of Report 68-28 with the Fort Eustis experience and data to derive meaningful component lists and limits for the various models of the UH-1 helicopter.

The revised tape lists have been identified by standard Curtiss-Wright acoustic 5200 series numbers as shown in Table I.

*Gray, W. B., and Locklin, R. G., CWEA-4 SONIC ANALYZER WITH UH-1 HELICOPTER CAPABILITY, Curtiss-Wright Corporation; USAAVLABS Technical Report 68-28, U.S. Army Aviation Materiel Laboratories, Fort Eustis, Virginia, May 1968, AD674198

TABLE I. UH-1 HELICOPTER SONIC ANALYZER TAPE IDENTIFICATION NUMBERS

Tape Title	68-28 Tape No. (All Models)	Helicopter Model UH-1A UH-1B UH-1C	UH-1D
Transmission and Tail Rotor Components	109	5210	5240
Engine Components	110	5220	5250
Other Transmission Bearings	111	5230	5260

DISCUSSION

APPLICABLE DATA

Data Available

Sonic data available on the UH-1 helicopter for use in this report were taken from the following two sources:

1. USAAVLABS Technical Report 68-28, 1967 data

2. Fort Eustis tests, 1968 data

Table II shows a summary of the number of checks available for the various models of the UH-1 helicopter. Note that data for the UH-1A and UH-1C models were nil. Because of this and because of the similarity of these models to the UH-1B, they were carried along with the B model throughout.

The original data of Report 68-28 are not directly comparable with tape 109, 110, and 111 data since listings and some gains were revised for these updated tapes. However, if detail investigation of a particular component was required in selecting new limits, the data could be compared in most cases by means of a cross index list and by taking differences in gain settings into consideration.

The 27 checks of the UH-1B for Report 68-28 were combined with the 10 from the Fort Eustis data for a total of 37 checks for tape 109. The primary portion of the analysis was based essentially on the following number of checks:

	UH-1B	UH-1D
Tape 109	37	33
Tape 110	10	33
Tape 111	10	33

Emphasis for both models was placed on tape 109, which consisted of selected transmission and tail rotor components, including the primary drive gears.

Condition meter readings available for the various components and models of the UH-1 helicopters are given in Tables III through IX.

Decisionmaking Aids

Primary decisions required to accomplish this program were:

1. Delete or retain certain data so as to have an edited set of data of high reliability to work with.

2. Use or not use a common tape and test rpm for all models of the UH-1 helicopter.

3. Revise or not revise the particular component gain setting.

4. Decide the overall integrity of the finalized tape(s) and its constituent components.

Certain direct aids, singly or in combination, were available or made available to assist in the decisionmaking process. Further description and application discussion of most of these aids appear in this report. The following list is intended only to identify them:

1. Ratings on locking ability and the locking frequencies as taken from the Ft. Eustis data tapes (shown in Table X).

2. Peak probability meter reading printouts of components based on the data remaining after initial editing (shown in Tables XI through XVI).

3. Teardown inspection results versus condition meter readings as discussed in Report 68-28 (summarized in Table XVII).

4. Helicopter maintenance records as noted on original data sheets during period of checking.

5. Flight crew, mechanic, or analyzer operators' general comments as noted on original data sheets during period of checking.

In addition to the direct aids listed above, other items which influenced the decisionmaking process included the following:

1. Signal-to-noise ratios.

2. Cross-check of components of similar frequencies, same microphone and lock signal.

3. Excessive noise levels.

4. Single reject readings that are unique among many with no detail records available.

5. Selection of limits that would best suit future data procurement for a questionable component.

6. Checks which showed normal readings shortly before and after a reject check on the same helicopter with no known maintenance having been performed.

7. Cross-check of harmonics to the fundamental.

8. Creep increment increases on successive checks of the same helicopter.

9. Fluctuating meter readings.

10. External noise causing meter to intermittently peg as audible on tape playback.

11. Inability to confirm original data by tape playback.

12. General mathematical distribution of peak probability data.

The above listings are representative of the types used in the logic process of decisionmaking. Full log records are available for most cases but are not included in this report because over 1000 component checks are probably involved, and also because of the ambiguity in presenting many of them in a comprehensive tabular format. For illustration, several sample deletion sheets are shown in Tables XVIII and XIX.

DATA ANALYSIS

Initial Data Edit

An initial rough edit was made on the available data before the data were processed through the digital computer. The purpose was to delete many of the readings that might adversely influence the selection of revised limits. The deleted readings are marked by asterisks on the data sheets in Tables III through IX.

This edit, as were later more detailed edits, was made with the attitude that it was better to delete questionable data than to have them remain and adversely influence limit selections. This does not mean, however, that wild, indiscriminate deletions were made but rather that decisions were made using the decisionmaking aids previously described, with any benefit of doubt going to deletions rather than retentions.

The data remaining after this initial edit were then forwarded to our digital computer for peak probability data printouts.

Peak Probability Data

A system was written and programmed in the IBM digital computer to count and print out the number of component checks falling within each meter reading increment unit of one, covering the entire meter range from 1.0 to 10.0. The data were processed for each component item of each tape, and the printouts are shown in Tables XI through XVI.

These printouts were used as the reference criteria for determining those meter readings that required detail investigation by the decisionmaking aids and finally as an alignment reference for making limit revisions in decibels. This will become more obvious later on in the discussion.

TABLE II. NUMBER OF ANALYZER DATA CHECKS AVAILABLE

Helicopter Model	Report 68-28 Original Data				Updated Data Tape No.*			Ft. Eustis Updated Data Tape No.*		
	Engines	Bearings	Tail Rotor	XMSN	109	110	111	109	110	111
UH-1A	0	4	4	3	0	0	0	0	0	0
UH-1B	10	13	13	13	27	0	0	10	10	10
UH-1C	0	0	0	0	0	0	0	0	0	0
UH-1D	1	2	2	1	0	0	0	33	33	33

* 109 - Transmission and Tail Rotor Components

110 - Engine Components

111 - Other Transmission Bearings

TABLE III. UH-1B CONDITION METER READINGS, TAPE 109, XMSN AND TAIL ROTOR, USAAVLABS REPORT 68-28, 1967

Tape	(1)**	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(1)	(1)	(1)	(2)	(2)	(2)	(2)	(1)	(2)	(3)	(3)	(3)	(4)	(3)	(1)	(1)	(3)
Item	0760	0724	1962	0745	0719	0730	8704	8548	1964	8548	1888	3562	0763	0730	1964	0745	0724	1954	3562	0730	1964	0745	1964	3562	3547	0741	0724
1	2.5	5	5.5	2.5	5	4	2	1.5	3	1.5	4	4.5	1	3.5	2	2.5	4	2	3	3	2	1	1.5	2	0.5	2.0	1.5
2	4	4.5	6.5	2	8	5	2.5	1	6.5	1.5	2.5	5.5	5	5.5	4	3	8	3	4.5	5	2.5	1.5	2.5	1.5	1.5	2.0	1.5
3	2	3.5	4.5	2.5	3.5	5	1.5	1	2.5	1.5	3	5	2	7	3.5	2	2.5	2.5	4.5	5.5	1.5	1.5	1	1.5	1	2.0	1
4	4	5	5	2	3.5	3.5	3	2	4	1.5	3.5	5	2.5	*P	2.5	3.5	6.5	2	3.5	8	1	0.5	1.5	1	0.5	1.5	1
5	3.5	6.5	6.5	2.5	4.5	6.5	3	2	5.5	3	5.5	7	2	*P	4	4.5	8	4	7.5	7.5	2.5	1	2.5	2.5	1	2	1.5
6	2.5	4.5	5	2.5	3	4.5	1.5	1	3	1.5	4	5	1.5	5	2.5	3	5.5	2.5	4	3.5	1.5	0.5	1.5	2.5	1.5	1.5	0.5
7	5.5	4	5	3	6	5	2.5	1.5	8	1.5	*P	9	4.5	*P	2	3	3.5	3	7	7.5	2	2	2	3	1.5	2.0	2
8	2.5	6.5	6.5	1.5	5	3	2.5	5	4	5	4	4	4	*9.5	3	6	7.5	2.5	9.5	*9	1.5	1	1.5	1.5	1	1.5	3
9	7.5	5.5	7.5	3	4.5	8	3	1.5	2.5	2.5	7.5	*9.5	2	7	4.5	3	4	3.5	4	6.5	3.5	2.5	2	2	1.5	1.5	2.5
10	6.5	6	7.5	1.5	7.5	6	2.5	2	5.5	2	5	4	2	5	4	2.5	7	3	3.5	3.5	2.5	1	2.5	1.5	1.5	1.5	2
11	5	3	5.5	2	4	5	1.5	1	3	3	3.5	4.5	1.5	3.5	1.5	2	2.5	3	2.5	4.5	2	1.5	2	2	1	1.5	2
12	6.5	9	7	3.5	4.5	5	3.5	4	4	4	6.5	6	1	6	4.5	2.5	8	3.5	5	7	2.5	1.5	3	1.5	1.5	1.0	3
13	8	4.5	8.5	1	8.5	5	7.0	4.5	8.5	4	7.5	9	1.5	8	9.5	5	6	2	6.5	*9	4.5	0.5	5	1.5	2	1.5	3
Noise	1.5	1.5	1.5	0.5	0.5	0.5	0.5	1	1.5	0.5	1	1.5	0.5	1.5	1	0.5	1.5	0.5	1	2	0.5	0.5	0.5	0	0	0.5	0.5
14	8	4.5	8.5	1.5	8.5	4.5	7.0	4.5	8.5	5	7.5	9.5	1.5	8.5	9	5	6.5	2	6.5	9	4.5	0.5	5.5	1.5	2	1.5	3
15	3.5	*3	3.5	*1.5	3	1	1	2.5	1	2	3.5	4.5	0.5	3.5	1	3.5	3.5	*3.5	2.5	2.5	1	*1	1	*1.5	1	*1	1.5
16	2.5	*3.5	3	*1	3	0.5	0.5	1	2	1	2.5	7	0.5	4	1.5	1	3	1	1	2.5	1	*0.5	1	1	0.5	0.5	0.5
17	1.5	1	1	0.5	3	1.5	0.5	0.5	0.5	1	1	1.5	1	2	1	0.5	1.5	1	1	2.5	0.5	0	1.5	0.5	0.5	0.5	1.5
18	5	*10	9.5	3	2.5	6	6.5	5.5	8	3.5	3.5	9.5	8	*P	6	4	*10	5	6.5	4	1	1.5	4.5	2	0.5	1.5	*8.5
Noise	1.5	2.5	2	0.5	1.5	1.5	0.5	1	1	1	2	1.5	0.5	3.5	1.5	2	3.5	0.5	1.5	1.5	0.5	0.5	0.5	0.5	0	0.5	1
19	5	10	9.5	3	4	6	6.5	6	9	4.5	4	9.5	8	P	6.5	4.5	10	5	6.5	4	2	1.5	6	1	1	1.5	8.5
20	4.5	4.5	2.5	*2	2	2	2	1.5	2	1	2.5	2	1.5	5	1.5	*2.5	4.5	1.5	2	*3.5	0.5	*2	0.5	0.5	0.5	0.5	3
21	3	5	4.5	1	2	1.5	1.5	0.5	2	0.5	1.5	1	3	3.5	2.5	*3	3.5	2	3	*3	1	*0.5	0.5	0.5	*1.5	0.5	2.5
22	2.5	1	4	*2	2.5	2.5	0.5	2.5	2	3	1.5	1	3.5	2.5	0.5	1.5	*7	2	1	2	*1.5	0.5	1.5	0.5	0.5	0.5	1.5
23	*P	2	2.5	2.5	4.5	*P	2	2.5	6.5	4.5	4.5	4	4	4	*P	6.5	4	1.5	4	*P	4.5	2	*8.5	2.5	5.0	2.5	4.5
24	3	1.5	6.5	1.5	6.5	3.5	2	2.5	7.5	4	3	2.5	7.5	1.5	4	2.5	2.5	2	2	4	3.5	1.5	6.5	2	3.5	4.5	2
25	4	1.5	10	3	3.5	*P	5	1.5	*P	8.5	P	6.5	P	0.5	*P	6.5	7	2	3.5	2	7	0.5	*P	1.5	*7-P	P	6
26	5	2	2.5	3	6	3.5	2	1.5	5	1.5	4.5	5	5	2	*P	6.5	3	1	2	6	4	2	4.5	4	5.0	P	3.5
27	5	2.5	3.5	6	2.5	3.5	2	3	3.5	4	3.5	5.5	2.5	1	6	7.5	4	1.5	*P	6	*P	1.5	4.5	2	5	2.5	5.5
28	3	2.5	10	1.5	4	4.5	2	1.5	3	1.5	2	5.5	*P	1.5	5	2.5	6.5	7.5	5.5	3	2	1	7	1	*8-9.5	4	4
29	9	7.5	P	1.5	6	7	5	4	*P	6.5	3.5	7	P	1.5	*8.5	*9.5	*10	1.5	8.5	*P	*P	0.5	*P	8	7-9.5	P	P
30	2.5	2	1.5	2	3	1.5	3	1.5	8	1.5	2	3	2	0.5	4.5	3	7	1	2.5	2.5	2.5	2	4	1	4.5	2.5	2.5
31	5	4	6	3.5	5	6	2.5	3	5	3	3.5	3	4	2	3.5	2	6.5	3	2.5	3	3.5	3.5	4.5	2.5	7.5	4.5	4
32	5	5	4	2.5	6.5	6.5	5	2	2	3	5	4	5	3.5	2	1.5	3	3	4.5	4	4.5	4	3	2.5	4.5	2.5	3.5
33	5	4	5	3	5	7	3.5	3.5	4.5	3	4.5	5	5	4	3	2.5	6.5	3.5	6.5	4.5	3	2.5	4	3.0	6.0	6	4.5
34	4.5	3	4.5	3.5	6	5	4	3.5	4.5	3.5	4	4	4.5	4	3.5	4	3	5	5	4.5	6.5	3.5	4.5	3.5	5.5	5.5	3
35	4	3	5.5	3	3.5	2	6.5	3	6	4	4	4	3	2.5	1.5	2.5	4	2.5	5	3	3.5	2	4.5	3.5	4.5	4.5	3

TABLE III - Continued

Tape Item	0760	0724	1962	0745	0719	0730	8704	8548	1964	8548	1888	3562	0763	0730	1964	0745	0724	1954	3562	0730	1964	0745	1964	3562	3547	0741	0724
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3.5	2	3.5	5	5.5	-	7	5	-	6	3.5	3
37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	1.5	0.5	3	4	5.5	-	7.5	3-8	-	5.5	3.5	3
38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	3	2.5	1.5	-	7	2.5	-	5.5	3	4
39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	*P	6	6.5	P	2	-	6	7-9	-	7.5	P	3.5
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	6	6	4	8.5	2.5	-	7	6	-	*7-P	3	2.5
41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	7	3	5	5	1.5	-	7	4.5	-	6	3	2
42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	3	2	3	4.5	1.5	-	*9.5	3	-	3.5	4	2
43	6.5	5.5	5-10	6	*8-P	5	6.5	6	6	6.5	6.5	6.5	8.5	5	4	4	5.5	6	7	6	7	4.5	6	4	7-9.5	8.5	3.5
44	6.5	3.5	9	5	5	2.5	8.5	4.5	7	*9.5	3	3	5	2	3	5	3	6.5	3.5	2.5	3.5	1.5	4.5	2	2.5	4	2
45	4	2	3	2	4	1.5	4	2	5	1.5	*P	7	7	1.5	3	1.5	3	4	7.5	1	2	4	4	1	5.5	2.5	4
46	2.5	3	3.5	2	4	1	3	1.5	4.5	3	3.5	2	3.5	6	2	1.5	3.5	2	2	2	3	1.5	3	1.5	6-9	6.5	2
47	9.5	4.5	5	2	6	2	8	3.5	*8.5	2.5	3.5	5	4	1.5	3.5	5	4.5	7	5	4	4	3.5	*9	4	5	6.5	2
48	4	4	5.5	3	3.5	3	4.0	3	5	3	4	4	3.5	3.5	3.5	3	2.5	2.5	3.5	3.5	3	1.5	3	2	4.5	4	2.5
49	5	4.5	5	4	5	3-9	4.5	3	6	4.5	6.5	3	6.5	3	1	4	4	3	5	4.5	6	5.5	*9.5	2.5	4.5	5	2
50	6	3.5	*8-10	3	P	5-9	P	5	5.5	5	4.5	4	4.5	5	1.5	2	5	4.5	5	3.5	5.5	3	4.5	3	*8-P	5	1.5
51	7	6	5-9.5	2.5	7.5	3.5	P	3	6	5	6.5	4	6.5	4	2	4.5	2	2.5	4	2.5	4	2	8	3	6.5	6.5	2.5
52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	4.5	2	3	7	2.5	-	4	3	-	-	4.5	2
53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	6.5	3	3.5	5	1.5	-	3.5	2.5	-	-	3.5	2.5
54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	6.5	1.5	4	P	3	-	4.5	3.5	-	-	P	2.5
55	5	2	3.5	4	4.5	*7-10	6	2.5	4.5	3.5	2	2	2.5	5	1	1.5	4	0.5	4	3	2.5	3	3.5	2	3.5	3.5	1.5
56	3.5	2	2.5	2.5	2.5	4	4	1.5	3	2.5	2	2	2.5	2	1.5	2	2.5	1.5	3	2	2.5	1	3.5	2	3	2.5	2
57	3	P	5.5	3.5	4	4.5	P	3	5.5	4	4.5	3	3	2.5	1.5	3.5	P	2	3	2	3.5	2	4	2	5.5	3.5	1.5
58	P	6.5	8-10	5	P	7.5	5	4.5	6.5	5	P	P	9.5	4.5	5	4	2.5	1	3.5	2	5	2.5	*P	2.5	6-9	5	3.5
59	9.5	2	4	2	7	3	4	5	6	6.5	6.5	4.5	5	3	2.5	1.5	3	2	2.5	1.5	4	2.5	8	1.5	5.5	2.5	3.5

*Deleted in initial data edit.

**Numbers in parentheses indicate 1st, 2nd, 3rd, or 4th check of aircraft no. shown below parentheses.

TABLE IV. UH-1B CONDITION METER READINGS, TAPE 109, XMSN AND TAIL ROTOR, FT. EUSTIS, VA., 1968

Tape	62-2101**		61-0778					61-0713		
Item	2/19	2/23	2/23	3/8	3/28	4/8	4/23	4/17	4/23	5/14
1	3	3	2	4.5	3	3.5	7.5	2	5.5	4
2	5.5	5	3	5	5	7.5	7	2.5	6.5	3
3	2	3.5	2.5	3.5	2	3	5	2.5	4	2
4	*8.5	1.5	1.5	7.5	5.5	4.5	7.5	4	7.5	3
5	3	5	2.5	6.5	5.5	6.5	7.5	4.5	7.5	*10
6	2.5	3.5	2	3.5	5	2.5	3.5	3.0	4.5	2.5
7	2.5	3.5	2	5	3	2.5	4	3.5	4.5	2.5
8	4.5	3.5	2	6	7.5	6.5	P	3.0	6.5	3.0
9	2.5	3.5	4.5	5.5	4.5	5.0	7.5	4.5	6.5	5
10	2.5	4	4.5	5.0	5.5	8.0	*8.5	3	6.5	2.5
11	1.5	3	2.5	2.5	3	4	4	3	4	2.5
12	4	3	7	5.5	7	5.5	7.5	4.5	*8.5	4.5
13	7	7.5	3	5	8.5	5	7	6.5	*P	5.0
14	7.5	7.5	3	5.5	8.5	5	7	5.5	10	5
15	2.5	2	1.5	2.5	3	1.5	2.5	3	6	3
16	4	2.5	2	4	6	2.5	4.5	2.5	4	1.5
17	1.5	0.5	2.5	2	3	3.5	4.5	1.5	3	1.5
18	8	5	9.5	9.5	P	8.5	P	6.5	9.5	3.5
19	8	5	9.5	9.5	P	8.0	P	6	9.5	3.5
20	1.5	1	3	3	5	5	4.5	3	6	3
21	2	1.5	1.5	5	5	5	5.5	3.5	4	1.5
22	1.5	1.5	5	6.5	5	3.5	6.5	4.5	7.5	5.0
23	2	1.5	1.5	1.5	1	1.5	1.5	1.5	1.5	2
24	5.5	1.5	1.5	1.5	2	1	2.5	1.5	1.5	1
25	7	6	2.5	2	1	2.5	2.5	3.5	2	2
26	4.5	2	1	2	1	1.5	1.5	1	1.5	3
27	1.5	2	.5	1.5	1	1	1	1	1	1
28	3.5	1.5	1.5	1.5	1.5	1.5	1.5	1	1.5	1.5
29	3.5	7.5	2	4.5	3.5	3	2	1	1.5	2
30	2.5	3	.5	1	1	1	1	1	1	1
31	1.5	1	1	2	1	1.5	1.5	1	1	7.5
32	3.5	1	1.5	1.5	1	1.5	1.5	2	2	1.5
33	4	1	1.5	1.5	1.5	2	1.5	2.5	2	1.5
34	3.5	1.5	2	2	1.5	2.5	2	1	1.5	1.5
35	2	.5	1	1	1	1.5	1.5	1.5	1	1
36	*9.5	2	4	3	3.5	5	5	2.5	3.5	5.5
37	5	1.5	3	3.5	1.5	4	3.5	1.5	2.5	6
38	5.5	1	1	2	2.5	2.5	2.5	1.5	2.5	4.5
39	P	P	3.5	4.5	5.5	6.5	6.5	P	P	P
40	*P	2	2.5	*P	3.5	5.5	4.5	2.5	3	*P
41	*P	2.5	2.5	*P	2.5	4.5	4.5	2.5	2	*10
42	*P	3	2	8.5	2.5	4.5	3.5	1.5	4.5	6
43	6	2.5	2	6.5	2	3	3	2	1.5	5.5
44	8.5	1.5	2	*9.5	3	2	2.5	4.5	2	2

TABLE IV - Continued

Tape	62-2101		61-0778					61-0713		
Item	2/19	2/23	2/23	3/8	3/28	4/8	4/23	4/17	4/23	5/14
45	5	1	1.5	5.5	2.	2	1.5	*P	2.5	1
46	3	1	1	6.5	1	1	1	1	1	1
47	8	1.5	1.5	5	2	1.5	1	1	1	1
48	2.5	1	2	5.5	1.5	1	1.5	1.5	1	1
49	2.5	1	1	5	2	1.5	1.5	1.5	1	1
50	2.5	.5	1	6	3	1.5	1.5	1.5	1	1
51	3.5	1	1.5	9	2.5	*10	1	1	1	1
52	6.5	2.5	2.5	5.5	4.5	3.5	3.5	2.5	2.5	3
53	P	8	3	5.5	3	4.5	3.5	*P	8.5	9.5
54	8.5	5	2.5	10	3	4.5	4	5.5	5.5	P
55	2.5	1	1	2.5	2	1.5	1	1	1	1
56	2.5	1	1.5	4.5	1.5	1.5	1.5	1	1	1
57	2.5	1	.5	3.5	1.5	1	2.5	1	2.5	2.0
58	P	5	2	P	2	1	1	1.5	1.5	1.5
59	P	3.5	2	5.5	1.5	2.5	1.5	1	1.5	1

*Deleted in initial data edit.
**UH-1B serial no. and check dates.

TABLE V. UH-1D CONDITION METER READ

Tape Item	60-6032**					65-9773					65-9770			
	1/18	1/18	2/12	2/14	5/6	1/17	1/22	2/15	2/23	2/29	2/2	2/5	2/6	2/19
1	3.5	2.5	*3.5	2.5	7.5	*5.0	*6.0	6.5	6.5	10.3	*8.0	6.5	6.5	5.5
2	4.5	2.5	*3.5	0.5	4.5	*5.5	*5.5	4.5	5.5	6.5	*7.0	6.0	7.0	6.5
3	3.5	3.0	*0.5	3.5	4.5	*4.5	*6.0	5.5	5.0	7.0	*6.0	5.0	7.0	4.0
4	4.0	3.5	*3.5	3.0	8.0	*4.5	*7.0	4.0	5.0	10.3	*8.0	8.5	10.3	6.0
5	6.5	5.0	*6.5	10.3	6.5	*7.5	*8.5	7.0	8.5	10.3	*9.0	10.0	10.3	6.0
6	4.0	4.0	*3.5	3.5	5.5	*5.5	*6.5	6.0	5.5	9.5	*7.0	5.5	6.5	6.0
7	8.0	7.0	*5.0	5.0	5.0	*5.0	*5.5	5.0	5.5	6.5	*7.5	6.0	8.0	7.0
8	8.0	8.5	*4.5	3.5	5.0	*6.0	*6.0	3.5	6.0	6.0	*9.0	6.5	8.0	4.0
9	3.5	6.0	*1.5	10.0	5.5	*7.0	*9.0	7.5	7.5	10.3	*8.5	7.0	10.0	3.5
10	4.0	5.0	*3.0	6.0	5.0	*6.0	*5.5	7.0	6.0	5.0	*6.5	6.3	6.5	4.0
11	2.5	3.5	*3.5	5.5	4.0	*4.5	*4.0	4.5	4.5	6.5	*5.5	4.5	4.5	3.5
12	3.0	4.5	*5.5	4.5	6.5	*6.5	*6.5	6.5	6.0	9.5	*7.5	5.0	6.5	2.5
13	6.5	7.5	*5.0	7.5	5.0	*9.5	*9.5	4.5	4.0	2.5	*9.5	5.5	7.0	3.5
14	6.0	7.5	*2.5	7.5	8.5	*10.3	*9.0	*3.0	*2.0	*2.5	*9.5	*5.5	*6.5	*1.5
15	0.3	0.5	*4.0	1.5	2.5	*7.0	*5.5	*3.5	*2.0	*2.5	*5.5	*3.5	*5.0	*1.0
16	1.0	1.5	*0.5	2.5	2.0	*5.5	*3.0	*1.5	*3.0	*3.0	*3.0	*4.0	*5.5	*0.5
17	1.0	1.0	*0.5	0.5	5.0	*5.0	*5.5	2.5	*2.0	*2.0	*5.0	*3.5	*3.0	*0.5
18	7.5	6.5	*0.5	6.0	8.0	*10.3	*9.0	8.0	10.3	2.5	*10.0	4.5	8.5	7.0
19	7.5	7.5	*0.5	4.5	8.0	*10.3	*8.5	4.5	*10.3	*3.5	*10.3	*5.0	*8.0	*7.5
20	2.0	2.0	*2.0	1.5	4.5	*6.0	*4.5	3.0	*4.0	*0.5	*4.0	*2.5	*3.5	*2.0
21	2.5	3.0	*2.5	1.5	3.0	*6.0	*3.5	1.5	*3.0	*0.5	*4.0	*3.5	*5.5	*1.5
22	1.5	2.5	*1.5	1.0	4.0	*8.0	*6.5	*2.0	*6.0	*0.5	*3.5	*8.0	*5.5	*2.0
23	2.0	3.5	-	2.5	4.0	*10.3	*10.3	2.5	2.0	5.5	*10.3	4.0	*9.5	*10.3
24	1.0	2.0	-	1.0	1.0	*6.0	*10.3	1.0	1.0	1.5	*4.0	1.5	4.5	4.0
25	0.5	3.5	-	1.0	1.0	*4.0	*10.3	1.0	2.0	5.5	*8.0	1.5	5.5	6.5
26	0.5	1.0	-	1.0	1.0	*5.5	*5.5	1.0	1.0	1.5	*2.5	1.5	3.5	3.0
27	0.5	1.5	-	1.5	1.0	*4.5	*8.5	1.0	1.0	1.0	*4.5	3.5	7.0	3.0
28	1.0	5.0	-	2.5	6.0	*5.5	*10.3	1.5	1.5	1.5	*10.3	3.5	6.5	3.5
29	0.5	3.0	-	1.5	2.0	*6.5	*10.3	2.0	4.0	4.5	*6.5	3.5	4.5	7.0
30	0.5	1.0	-	0.5	1.0	*2.5	*2.0	1.0	1.5	1.0	*1.5	1.0	1.0	1.5
31	2.0	5.5	-	2.0	10.3	*10.3	*10.3	2.5	6.0	6.0	*7.5	3.0	9.0	8.5
32	6.0	4.0	-	2.0	1.5	*10.3	*10.3	2.5	3.0	1.5	*8.0	3.0	6.5	5.5
33	2.5	3.0	-	2.5	1.5	*10.3	*10.3	3.0	4.0	1.5	*8.5	3.5	6.5	6.5
34	4.0	3.5	-	3.5	2.5	*7.0	*7.5	2.0	6.0	1.0	*5.5	3.5	3.0	5.5
35	1.5	3.5	-	2.5	1.0	*10.3	*10.3	3.5	2.0	1.5	*10.3	*4.5	*10.3	*9.5
36	6.0	6.0	-	5.0	4.5	*10.3	*10.3	1.5	5.0	1.5	*10.3	*10.3	*10.3	*10.3
37	3.5	6.0	-	4.5	4.5	*10.3	*10.3	1.5	4.0	2.0	*10.3	*10.3	*10.3	*10.3
38	3.0	4.5	-	3.5	4.0	*10.3	*10.3	1.0	4.0	1.0	*10.3	*10.3	*10.3	*10.3
39	6.5	10.3	-	7.0	10.3	*10.3	*10.3	7.0	10.0	10.3	*10.3	10.3	10.3	10.3
40	2.5	8.5	-	6.0	10.3	*10.3	*10.3	6.5	7.0	10.3	*10.3	10.3	10.3	10.3
41	4.5	6.0	-	5.0	7.0	*10.3	*10.3	5.5	2.0	2.5	*10.3	*10.3	*10.3	*10.3
42	5.0	6.0	-	5.5	4.0	*10.3	*10.3	3.0	1.5	1.5	*10.3	*10.3	*10.3	*10.3
43	2.0	3.0	-	1.0	4.5	*10.3	*10.3	4.5	1.5	1.5	*9.0	3.0	6.0	7.5
44	1.0	3.0	-	1.0	1.0	*10.3	*10.3	3.0	4.0	1.0	*10.3	4.0	6.5	5.5
45	2.0	4.0	-	1.5	1.0	*10.3	*10.3	2.5	1.0	1.0	*10.3	4.0	7.0	8.0
46	1.0	2.0	-	1.5	1.0	*9.0	*10.3	2.0	2.0	0.5	*8.5	2.5	4.5	4.5
47	1.0	1.5	-	0.5	1.5	*7.5	*9.5	3.0	1.0	1.0	*10.3	2.5	3.0	6.5
48	1.5	2.5	-	1.0	1.5	*10.3	*10.3	4.5	2.0	1.0	*10.3	*4.5	*9.5	*7.5
49	3.5	3.5	-	2.0	2.0	*10.3	*10.3	5.0	2.0	1.5	*10.3	*5.0	*10.3	*10.0
50	2.0	4.5	-	2.0	1.5	*10.3	*10.3	5.5	2.0	2.0	*10.3	*5.5	*10.3	*10.0
51	4.0	3.5	-	1.0	2.5	*10.3	*10.3	4.5	2.0	1.0	*10.3	*5.0	*10.3	*10.3
52	4.5	3.5	-	3.0	3.0	*10.3	*10.3	5.5	2.5	3.0	*10.3	*4.0	*10.3	*10.3
53	5.5	5.0	-	4.0	6.0	*10.3	*10.3	5.0	3.0	6.0	*10.3	*10.3	*10.3	*10.3
54	5.0	5.0	-	3.5	10.3	*10.3	*10.3	2.5	2.0	10.3	*10.3	10.3	10.3	10.3
55	3.5	4.5	-	2.0	2.5	*10.3	*10.3	2.5	2.5	2.0	*10.3	*5.0	*10.3	*10.3
56	2.5	3.5	-	1.5	1.5	*10.3	*10.3	2.0	1.5	1.0	*10.0	3.0	7.0	7.5
57	2.5	5.0	-	2.0	2.5	*10.3	*10.3	1.5	1.5	1.0	*10.3	7.0	10.3	10.3
58	2.5	3.0	-	2.5	6.5	*10.3	*10.3	2.0	6.0	1.5	*10.3	*2.5	*7.5	*9.0
59	2.0	2.5	-	1.5	1.5	*10.3	*10.3	1.5	1.0	1.5	*10.3	*4.0	*6.5	*8.5

*Deleted in initial data edit.

** UH-1D serial no. and check dates.

, TAPE 109, XMSN AND TAIL ROTOR, FT. EUSTIS, VA., 1968

'25	65-9959			65-9771					63-12992		65-9772			65-9740		65-9739		66-1012
	2/28	4/2	5/2	3/11	3/15	3/19	3/22	5/21	3/19	4/4	4/9	4/19	5/2	4/8	4/8	4/10	4/15	4/15
.5	6.5	9.5	4.0	9.5	6.5	4.5	6.5	*10.3	7.5	6.5	3.5	4.5	6.0	5.0	8.5	8.0	4.5	6.0
.0	6.5	7.5	5.0	7.5	7.0	4.5	5.5	*6.5	6.5	5.0	7.5	6.5	7.0	6.0	5.5	6.5	4.0	7.5
.0	4.5	6.5	2.0	8.0	5.5	4.0	4.5	*8.0	7.5	4.5	3.0	3.5	5.0	3.0	6.0	6.1	8.0	4.5
.5	5.5	9.0	6.0	*9.5	7.5	3.0	7.5	*10.3	4.5	6.0	4.0	6.5	10.3	3.5	10.3	10.0	3.5	8.5
.0	6.5	10.0	0.1	*10.3	*10.3	6.5	9.0	*9.5	10.3	8.0	5.5	6.5	8.5	7.5	10.3	10.0	4.5	8.5
.5	5.5	6.5	5.0	*8.5	6.5	3.5	6.0	*9.0	*0.5	5.5	4.0	5.5	5.5	5.5	8.5	6.5	4.5	6.0
.0	5.0	6.5	4.5	*9.0	7.0	6.0	5.5	*8.5	9.5	6.0	4.0	6.5	5.5	5.0	7.5	7.0	3.5	7.5
.5	5.0	8.5	6.0	7.5	*8.3	3.5	1.0	*10.0	*10.3	7.5	6.8	6.8	10.3	4.0	8.5	8.5	5.0	6.5
.5	6.5	10.5	3.0	*10.3	*10.3	6.5	7.5	*8.0	6.5	7.0	5.5	7.5	10.3	7.0	10.3	8.5	8.5	10.3
.5	7.5	7.5	5.0	6.5	7.0	4.0	5.5	*6.0	4.0	5.5	4.5	5.5	7.5	7.5	6.5	6.5	5.5	6.5
.5	4.5	5.0	2.5	6.0	5.5	3.5	4.5	*6.5	4.5	5.0	3.5	3.5	5.5	4.5	5.0	6.0	5.5	4.5
.5	4.5	10.3	5.0	*10.3	*10.3	6.0	10.3	*10.3	5.5	8.5	10.3	7.0	10.3	4.0	10.3	10.3	7.0	7.0
.3	9.0	9.5	8.5	6.5	6.0	7.0	7.5	*10.0	6.5	9.0	6.5	10.0	7.0	6.5	6.5	10.0	6.5	9.5
.3	9.0	10.0	8.5	*6.5	*7.0	*8.0	*7.0	*10.3	7.0	*9.0	6.5	10.0	9.5	6.5	6.5	10.0	6.5	9.0
.5	*3.5	3.5	3.0	*3.5	*6.5	*6.5	*4.5	*4.0	1.5	*4.5	2.0	3.0	3.0	3.5	5.0	4.5	2.0	3.0
.0	4.0	4.0	1.5	*4.0	*4.5	*2.0	*3.5	*5.5	1.5	*7.5	1.5	1.5	3.0	4.0	4.0	4.5	1.5	3.0
.5	3.5	6.5	3.0	*5.0	*3.5	*1.5	*5.5	*8.5	1.5	*4.5	3.0	2.0	6.0	2.5	3.5	4.5	1.5	3.5
.5	10.3	10.3	9.5	*9.5	7.0	4.5	9.5	*10.0	10.3	10.3	10.0	9.5	9.5	2.0	9.5	10.0	9.0	10.0
.0	*10.3	10.0	9.5	*9.5	*8.0	*4.5	9.5	*10.3	*10.3	*10.3	9.5	9.5	9.5	*1.0	9.5	9.5	9.0	9.5
.0	*2.5	5.5	2.5	*3.5	*1.5	*2.5	4.0	*4.0	*2.5	*4.5	4.0	4.5	5.0	*2.0	5.0	4.5	3.0	5.0
.5	*4.5	5.5	3.5	*3.5	*3.5	*2.0	4.5	*6.0	*2.5	*4.0	5.5	4.0	7.5	*1.5	5.0	3.5	2.5	2.5
.5	*7.5	6.5	2.5	*3.5	*2.5	*4.0	2.5	*3.0	*2.0	*1.5	7.5	3.5	3.5	*1.5	5.5	*8.5	2.5	6.5
.5	3.5	4.5	5.5	3.9	5.5	3.0	2.0	*5.5	5.0	1.5	2.5	2.5	5.5	3.0	2.5	2.0	3.0	2.0
.5	2.0	1.5	1.0	1.5	3.5	2.0	1.0	*2.5	2.5	1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.5	1.0
.5	1.5	2.0	1.0	1.7	2.0	4.5	1.0	*3.0	1.5	1.0	2.5	1.0	1.5	1.5	1.0	1.0	1.0	1.0
.5	1.5	1.5	1.0	1.0	2.0	1.0	1.0	*2.5	1.5	1.0	1.5	1.5	2.0	1.0	1.0	1.0	1.0	1.0
.5	1.5	1.5	1.0	1.0	2.5	1.0	2.0	*2.0	1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.0	1.0	1.5
.0	1.0	2.0	1.0	1.0	3.0	1.5	1.0	*2.0	1.5	1.0	1.0	1.0	1.0	1.5	1.0	2.0	1.0	1.0
.5	2.5	3.0	4.5	5.5	6.5	2.5	2.5	*3.0	2.0	2.0	3.5	2.5	4.5	1.5	1.0	3.0	1.0	1.5
.5	1.0	1.0	1.0	1.0	2.0	1.0	1.0	*0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
.0	2.5	2.5	10.3	3.0	5.0	3.5	2.0	*8.0	6.0	2.0	1.5	3.0	10.3	8.0	2.0	2.0	1.5	2.0
.5	3.0	4.0	1.5	4.0	5.5	3.5	1.5	*4.0	4.0	1.5	2.0	2.5	2.0	3.0	2.0	2.5	3.5	2.5
.0	3.5	5.0	2.0	3.5	5.5	3.5	2.5	*3.5	4.5	2.0	2.5	2.0	2.0	2.5	2.0	3.0	2.5	2.5
.5	2.5	2.5	1.0	1.5	3.5	1.5	1.0	*2.0	2.5	1.0	1.5	1.5	2.0	4.0	1.0	1.5	1.5	2.0
.0	3.5	4.5	1.0	2.5	5.5	3.0	2.0	*4.5	4.5	1.5	2.5	3.5	2.5	4.0	2.5	2.5	2.0	1.5
.5	4.0	3.5	2.5	*10.3	3.5	3.0	1.0	*7.0	6.0	6.0	2.5	3.0	3.0	4.0	2.0	4.5	6.5	2.5
.5	3.5	2.0	2.5	2.0	2.0	2.5	1.0	*5.0	6.0	4.5	1.5	2.5	3.5	2.0	1.5	3.0	4.0	2.5
.5	3.5	2.0	2.5	1.5	1.5	2.0	1.0	*4.0	6.0	2.5	1.5	1.5	2.5	3.5	1.5	2.5	4.5	2.5
.5	10.3	10.3	10.3	*10.3	*10.3	*10.3	8.5	*10.3	10.0	4.5	9.5	10.3	10.3	10.0	10.3	10.3	10.3	8.5
.5	5.0	10.3	10.3	5.0	5.5	4.5	1.9	*10.3	10.0	4.5	2.5	3.5	10.3	7.5	3.5	4.5	7.0	6.5
.5	5.5	5.5	3.5	4.5	3.5	4.5	1.5	*5.0	7.0	4.0	2.5	4.5	8.5	5.5	2.0	5.0	6.5	4.5
.5	3.5	4.5	2.5	4.0	2.5	4.5	2.5	*5.5	7.0	2.5	3.0	4.5	2.5	6.5	2.0	3.5	5.5	2.5
.0	3.0	4.0	2.5	2.5	5.0	2.0	2.0	*3.0	4.5	1.5	2.5	2.5	4.0	4.5	2.0	2.0	3.0	2.0
.5	2.5	2.5	1.5	2.0	6.0	2.0	1.5	*3.5	4.5	1.0	1.5	1.5	1.5	2.0	1.5	2.0	2.5	1.5
.0	3.0	3.5	1.5	2.5	5.0	3.0	1.5	*2.5	4.5	1.5	1.5	1.5	1.5	2.0	1.0	2.0	1.5	1.5
.0	1.5	2.5	1.0	2.0	3.0	1.5	1.0	*2.0	3.5	1.0	1.5	1.5	1.0	1.5	1.0	1.0	1.5	1.0
.0	2.5	2.5	1.0	2.0	4.5	2.5	1.0	*2.0	2.0	1.0	1.0	2.0	1.5	2.0	3.5	1.5	3.5	2.0
.5	4.5	4.5	1.5	3.5	6.0	2.5	2.0	*5.0	6.5	1.5	2.0	3.5	1.5	2.5	2.0	3.0	2.5	2.0
.5	5.5	6.5	2.0	5.0	8.0	3.5	2.5	*5.0	7.5	2.0	3.0	3.5	3.0	4.5	3.0	3.0	3.5	3.0
.5	5.0	5.5	3.0	4.0	7.5	3.5	2.5	*9.5	5.0	2.0	2.5	4.0	3.5	4.5	2.5	3.5	4.5	3.5
0	4.5	4.5	1.5	4.0	*10.3	3.5	1.5	*6.5	4.0	3.0	2.5	3.5	2.5	3.5	1.5	8.5	3.5	1.5
5	5.0	6.0	2.0	4.5	7.0	3.5	3.0	*4.5	*10.3	3.5	3.0	4.5	4.5	4.5	3.5	3.5	4.5	3.5
5	5.5	6.0	6.5	6.5	8.0	7.5	4.0	*10.3	*9.5	2.5	5.5	6.5	4.0	5.0	6.0	4.5	5.5	4.0
5	4.5	7.0	10.3	5.0	6.5	4.5	3.5	*10.3	*9.5	3.5	3.5	5.5	10.3	4.5	3.0	4.0	4.5	3.5
5	4.0	5.5	2.0	4.0	7.0	2.5	3.0	*5.0	4.0	2.5	3.0	3.5	3.5	4.5	3.0	3.0	4.0	2.5
5	4.0	3.5	1.5	3.5	6.0	2.0	1.5	*4.5	3.0	1.5	1.5	3.0	2.5	3.0	2.0	2.0	2.0	1.0
0	3.5	4.5	1.5	6.5	*10.3	*10.3	3.5	*5.0	10.3	3.0	3.0	4.0	4.0	3.0	3.0	3.5	4.5	9.5
5	3.5	4.5	3.0	4.5	6.5	4.0	2.0	*4.0	3.0	1.5	2.0	3.5	4.5	2.5	2.5	2.5	3.0	2.5
0	3.0	3.5	1.0	3.0	5.5	2.5	2.0	*4.5	3.0	1.5	1.5	2.0	1.5	2.5	1.5	2.0	2.0	1.0

TABLE VI. UH-1B CONDITION METER READINGS, TAPE 110, T53-L-11 ENGINES, FT. EUSTIS, VA., 1968

Tape	62-2101**		61-0778					61-0713		
Item	2/19	2/23	2/23	3/8	3/28	4/8	4/23	4/17	4/23	5/14
1	3	*4.5	4.5	*6	7.5	5	6.5	4.5	4	5
2	0.5	*1	1	*1	1	1	1	1	1	1
3	1	*1.5	1	*1	1	1	1	1	1	1.5
4	2.5	*6.5	4.5	*3.5	4	2.5	2.5	2.5	2.5	3.0
5	10.3	*7.5	4	*7.5	4	2	4	2.5	2.5	3
6	10.3	*6.5	4.5	*5.5	5.5	3	3.5	4.0	3.5	2.5
7	1.5	*8.0	6	*7.5	9.5	3	3.5	5	3.0	5
8	1.5	*7.5	3.5	*6	5	3.5	5	4	2.5	3.5
9	3.5	*9	6	*8.5	5	1.5	2	4	3.5	2
10	1.5	*7.5	4	*6.5	5.5	1	3.5	4	3.5	4
11	2.5	*8.5	8.5	*6	6.5	1	2.5	4.5	2.5	4
12	2	*7.5	6.5	*10.3	3.5	1	3	3.5	4.5	4.5
13	2	*6.5	4.5	*5	4	2.5	2.5	4	2	4
14	2	*7	6.5	*6.5	7	1	4.5	5	4	6.5
15	3	*10.3	5.5	*7	4.5	4.5	4.5	4.5	6.5	4.5
16	2.5	*7.5	4.5	*5	3.5	2.5	2.5	2	3	5.5
17	3	*10	8.0	*10.3	8	4.5	4.5	4.5	5.5	9
18	10.3	*8	6.5	*7	2.5	3.5	3.5	5.5	7	6
19	8.5	*5.5	5.0	*6	7	4.5	2.5	4	2	3
20	6.5	*8.0	6.5	*10.3	8.5	7.0	3.5	2.5	3	10
21	5.5	*5	4	*6	5	5	2.0	1.5	1.5	7
22	6.5	*10.3	10.3	*10.3	6.5	4.5	5.5	5.5	6	3.5
23	3.0	*7.5	7.5	*10.3	7	3.5	3.0	4	3.5	5
24	4.0	*7.5	6.0	*10.3	7.5	7.0	3.0	8	4.5	5.5
25	4.5	*4.5	4.5	*6.5	3	5.5	2.5	6	3	4.5
26	3	*6	5.5	*7	4.5	4.5	4.5	4.5	3.5	5
27	3	*5.5	4.5	*8.5	5	4.5	5.0	6	6	4
28	3	*6.5	3	*9.5	6.5	5.5	4.5	5.5	3	4
29	3	*5.5	3	*4	5	5.5	4.5	3	2.5	3.5
30	3	*8.5	6.5	*9.5	10.3	7	10.3	8	6	8
31	2	*4.5	5.5	*6.5	4	5.5	4.0	3.5	3.5	4.5
32	10.3	*10.3	2.5	*10.3	6.5	5.5	8.5	10.3	5	5
33	4.5	*6.5	4	*7.5	5	4.0	4.5	5.5	4.5	3.5
34	2.5	*7.5	7.5	*9.5	9.5	4.5	8.5	6	4.5	9
35	3.0	*9.0	3.5	*10	5	3.0	4.5	3.5	3.5	3
36	4.5	*8.5	5	*10.3	8.5	2.5	5.0	3.5	3	2.5
37	2	*10	8.5	*10.3	7	4.5	10	6	5.5	7.5
38	5.5	*4.5	5.5	*6	6.5	3.5	2.5	3.5	1	3.5
39	4.5	*8	4.5	*7.5	5.5	3.0	2	3	2	2.5
40	10.3	*10.3	6.5	*9.5	9	4.5	5	8	4	3.5
41	2	*4.5	2.5	*6.5	4.5	2.0	4	3.5	2.5	2
42	2	*7.5	3.5	*8.5	4.5	4.5	5	5.5	3.5	6

*Deleted in initial data edit.
**UH-1B serial no. and check dates.

TABLE VII. UH-1D CONDITION METER READINGS, TAPE 110, T53-L-11 ENGINES, FT. EUSTIS, VA., 1968

Tape	60-6032 **					65-9773					65-9770					65-9959		
Item	1/18	1/18 *	2/12	2/14	5/6	1/17	1/22	2/15	2/23	2/29 *	2/5 *	2/6	2/6	2/19	3/25	2/28	4/2	5/2
4	2.5		6.5	4.0	4.0	1	1.5	2.5	1.5			6	4	3.5	5.5	* 6	4	8
5	2.5		7	3	2.5	1	2.5	2.5	2.5			3	4.5	4.5	5.5	* 5.5	3.5	5.5
6	2		6.5	3.5	3.5	0.5	3	2	2.5			3	5.5	4.5	7	* 7	4.5	6
7	3		6.5	4.5	3	1	1	2	1.5			3	5	3.5	9	* 8	4.5	6.5
8	3.5		5	3	2.5	2	1.5	2	1.5			2	3.5	4	7.5	* 4.5	6	7.5
9	2		4	2	2	1	1.5	1.5	1.5			0.5	2.5	4	4.5	* 6.5	2	5.5
10	2.5		7	3.5	3	1.5	1.5	2	2			4.5	4.5	3.5	8.5	* 6.5	5	5
11	3.3		6	3	2.5	1.5	1	2.5	2			4.5	4.5	3.5	8.5	* 9.5	5.5	6.5
12	2.5		6	5.5	3	1	2	2	2			5	5.5	4	7.5	* 6.5	6.5	5
13	3.5		8.5	3.5	2.5	1	2	2.5	2			6.5	7.5	3.5	6	* 5	5	7.5
14	3.5		6	5	4	4	2.5	3	3.5			5	5.5	7.5	9.5	* 8.5	5.5	7.5
15	7.5		3	5.5	4	1	1.5	1.5	1.5			6.5	6	4	5	* 7	5	5.5
16	5.5		3.5	5.5	3.5	0.5	2	2	2			7.5	6.5	4.5	6.5	* 5.5	3.5	8.5
17	7.5		3	5.5	3.5	2.5	3	1.5	2.5			10	6.5	8.5	8	*10.3	6.5	7.5
18	5.5		5.5	2.5	2	3.5	10.3	4.5	10.3			3.5	7	10.3	5.5	* 8	8	4.5
19	4.5		5.5	2.0	1.5	4	10.3	3.5	7.5			1	5.5	10.3	3.5	* 6.5	4.5	10.3
20	8.5		10	4.5	4.5	4.5	10.3	6	10.3			3	10.5	10.5	6.5	* 8	6.5	3
21	4.5		5.5	2.5	1.5	2	9.5	2.5	7.5			2	5.5	10.3	2.5	* 5.5	3	3
22	8.5		6.5	4.0	3	1	3.5	2.5	10			8	7.5	6.5	5.5	*10.3	6.5	8
23	9.5		4.5	5	3	2	2.5	2.5	3.5			6	6.5	5	6.5	*10	10	7.5
24	10.3		3.5	10	5	1.5	2.5	2	3			5.5	6.5	5	6.5	*10	10	9.5
25	7.5		3	3.5	2	1	2	1.5	2.5			4	3.5	3.5	5	* 5.5	6.5	5
26	6.5		3.5	4	2.5	1.5	1.5	1.5	3.5			7.5	5	2	5.5	* 8.5	9.5	6
27	9		3.5	7.5	6	1	2.5	8	2			8.5	6.5	2.5	5.5	* 6.5	6.5	6
28	6.5		4.5	6.5	4	1	2.5	7	2.5			10.3	8.5	4	4	* 4.5	5.5	8.5
29	7.5		3.5	5	-	1	2.5	7	2			5	5.5	2.5	5.5	* 4.5	6	3.5
30	7.5		4	8.5	6.5	2.5	4	9.5	2			7.5	5.0	2.5	5.5	*10	8.5	6.5
31	6		3	5.5	5.5	1	2	1	2			3	4	3	5.5	* 8	7	5.5
32	7		3	5	3.5	1	4.5	6.5	5			5	5.5	5.5	6	* 9.5	7.5	3
33	6		3.5	3.5	4.5	0.5	2.5	7.5	2.5			3	5	3.5	4	* 5.5	5	4
34	8.5		4.5	10.3	4	1.5	3.5	10	2.5			10.3	9	4	7.5	*10.3	10.3	9.5
35	5.5		3.5	5.5	5.5	0.5	2	7	2			5	5.5	3	4.5	* 4.5	6	4.5
36	6		5	5	5	2	3	9	4			4	5.5	4.5	3.5	* 6.5	6.5	4.5
37	7.5		5	10	8	1	3	9.5	2			10.3	8.5	3.5	10.3	*10.3	10.3	9.5
38	6		4	10.3	10.3	1.5	5.5	5.5	4.5			6	6.5	6.5	4.5	* 7	7	2.5
39	4		3.5	4	3.5	1	5	4.5	4			3	5	5.5	2.5	* 7.5	4.5	2
40	4.5		5.5	5.5	5.5	1	4	6	3			7	6.5	4	6	* 9.5	7.5	8
41	5.0		3.5	6.5	4	0.5	1.5	5.5	1.5			3.5	3	1.5	3.5	* 4	4.5	4.5
42	6		3.5	5.5	5.5	1.5	2	6.5	1.5			6.5	5	3	4.5	* 5.5	10	5

TABLE VII - Continued

Tape	65-9771					63-12992		65-9772			65-9740	65-9739			60-1012
Item	3/11	3/15	3/19	3/22	5/21	3/19	4/4	4/9	4/19	5/2	4/8	4/8	4/10	4/15	4/15
4	4	3.5	5.5	3	2.5	2.5	2.5	3.5	5.5	* 7.5	2	3.5	6.5	1.5	3
5	10.5	5.5	2	3.5	4.5	2	2.5	4	4	* 3.5	3.5	4.0	4.5	1.5	3.5
6	9	5	2.5	3	4.5	2	4.5	3.5	3.5	* 3.5	2.5	4.5	5	1.5	3.5
7	4.5	3.5	3.5	4.5	5.5	1.5	5.5	6	4.5	* 3	4	3.5	6	1.5	5
8	6.5	4.5	7.5	4.5	4.5	2.5	4.5	5	4.5	* 4.5	3.5	2.5	5.5	1.5	6
9	2	3	3	3.5	3.5	2	2.5	4.5	2	* 3	3	3.5	7.5	1.0	3.5
10	2	4.5	5.5	5	6.5	2	5.5	5.5	4	* 3.5	4.5	2.5	5.5	2.5	6
11	3	6	6.5	5	6	1.5	4.5	7	4.5	* 4.5	4.5	4.0	5.5	3.5	10
12	2	6	7.5	4.5	5	2	5	5.5	5	* 3.5	5	4.5	6.5	2.0	5.5
13	4	7	5.5	4	5	2.5	4	5.5	5.5	* 5.5	3.5	3.5	8	1.5	6
14	5	4.5	5.5	5	4.5	2.5	5	6.5	6	* 3.5	4.5	5.5	9.5	2	7
15	7.5	5.5	5.5	5.5	5	5.5	6.5	4.5	4.5	* 8.5	4.5	4.5	4.5	3	7.5
16	3.5	4.5	4.5	3.5	4.5	5	3.5	3.5	5	*10.3	3	4.5	5	2	4.5
17	4.5	3.5	7	6	6	6	5.5	6.5	5.5	* 8	4.5	3.5	6.5	3.5	9.5
18	5	5.5	5.5	5	4	7	2.5	4.5	3.5	* 5.5	3.5	4.5	5.5	4	5.5
19	4.5	4	4.5	5.5	8	10	2	5.5	2	*10.3	5	5.5	3	1.5	2
20	6.5	7.5	10	10	3.5	10.3	2.5	10	2	* 2.5	7.5	9.5	4.5	1.5	3
21	3.5	5	4.5	5	2.5	10.3	2.5	8	1.5	* 2.5	4	5.5	2.5	1.0	1.5
22	7.5	8	5	5	3.5	6.5	5	5.5	4.5	* 8.5	4	6	5	3.5	5.5
23	9	6.5	7.5	3	8.5	5.5	4.5	6.5	6	* 8	7.5	6	5	2	10
24	9.5	7.5	4.5	10	7.5	8.5	6.5	8	4.5	* 9.5	7	7.5	5.5	3	10
25	7.5	4.5	3.5	5	4.5	4	2.5	5	3	* 6.5	4	4.5	4	2	3.5
26	5.5	5	4.5	3	6	4.5	4.5	5.5	3.5	* 5.5	4.5	3.5	4.5	4	7.5
27	5.5	4.5	5.5	8.5	5.5	5	6.5	5	4.5	* 8.5	5	6.5	4.5	4.5	6.5
28	6.5	4.5	6.5	4	5	5.5	5.5	4.5	4	* 9.5	4.5	5.5	4.5	3	6
29	4.5	4	5.5	5	4	6	4.5	4.5	3	* 4.5	4.5	5	6		4
30	6.5	5.5	5	5.5	6	6	8.5	6.5	8	* 8	6.5	4.5	6.5		5.5
31	5	5.5	3.5	7.5	6	5	6.5	4.5	3.5	* 4.5	7.5	3.5	5.0		3.5
32	6	5	5.5	4	4	4.5	5.5	5	3	* 3.5	6.5	5	5		4
33	5.5	3.5	3.5	4.5	8	4.5	4.5	5.5	2	* 3	6.5	4.5	4		3
34	8.5	7.5	8.5	8.5	10	6	9	9	6.5	* 9.5	4	7.5	2.5		7.5
35	4.5	2.5	3.0	4	4	4	5.5	5	5	* 5	2.5	5.5	3		5.5
36	5.5	8.5	4.5	4.5	3.5	4.5	5	3	2.5	* 5.5	2.5	4.5	3		4
37	8.5	7.5	7.5	6.5	5	6.5	7.5	9.5	4.5	* 9.5	4.5	6	2.5		9
38	9.5	7	7	2.5	3	8.5	6.5	6.5	3.5	* 3.5	3.0	6.5	3		6.5
39	3.5	4.5	3	3.5	3	7	3	7	4	* 4	3.5	6	2.5		3
40	4.5	5.5	4.5	7.5	3	6.5	10.3	6.5	5	* 8.5	3	4.5	2.5		6
41	8	9	7	6	4	3	4.5	3.5	3	* 5	2	2.5	2.5		4.5
42	5	5.5	6.5	4	6.5	4.5	5.5	7	4	* 5.5	2.5	6.5	4.5		4.5

*Deleted in initial data edit.
**UH-1D serial no. and check dates.

TABLE VIII. UH-1B CONDITION METER READINGS, TAPE 111, BEARINGS NOT ON TAPE 109, FT. EUSTIS, VA., 1968

Tape	62-2101**		61-0778					61-0713		
Item	2/19	2/23	2/23	3/8	3/28	4/8	4/23	4/17	4/23	5/14
1	*10.3	5.5	5.5	6.5	*6	2.5	2	2	2.5	4.5
2	* 7	7.5	6.5	7.5	7.5	2	3	*2	2.5	4.5
3	* 6.5	4	3.0	3.5	3.5	2.0	2.5	2	1.5	2.5
4	* 8	4.5	3.5	4	4	2.5	1.5	2	2	2
5	* 5.5	3.5	3.5	4	4	1	1	3.5	3.5	2.5
6	*10.3	4.5	5	* 5.5	4	2	2	4.5	4.5	8.5
7	* 8	8	9.5	10.3	10.3	2	2.5	3.0	3.5	5
8	* 8.5	7.5	6	6.5	5	2.5	4	4.5	3	3.5
9	* 9.5	4.5	5	5.5	5	3.5	*3	4	3	3.5
10	*10.3	3.5	3.5	4.5	5.5	2	4	10.3	10.3	10.3
11	* 4.5	4	6	6	8	2.5	3.5	3	1.5	2.5
12	* 8.5	6	4.5	5	4.5	1	2.5	2	2.5	2.5
13	*10.3	6	3	*10.3	4.5	1	1.5	1.5	2	1.5
14	*10	10.3	10.3	10.3	10.3	1.5	5	4	3	4.5
15	* 9	4.5	4	5	5	1.5	2.5	2.5	2	5
16	*10.3	3.5	2.0	3.5	3	1.5	2.5	1.5	2	3
17	* 7	4.5	5	6.5	4	2	3	5	3	4
18	*10.3	6.5	4.5	5.5	7	1.5	2.5	3	2.5	4.5
19	* 7	3.5	4.5	6.5	4.5	1.5	3	1.5	1.5	1.5
20	* 5.5	3.5	4.5	3.5	4	1.5	1.5	5	2	2
21	* 8	3	6.5	7.5	5	1.0	1.0	2	2	2
22	* 9.5	5.5	10.3	10.3	10.3	2.5	10.3	10.3	10.3	10
23	* 7.5	2.5	2	2.5	2.5	1.5	1.5	1.5	1.0	1.5
24	* 7.5	4	7.5	4.5	4.5	4.5	2	4.5	2.5	2.5
25	*10.3	6.5	3.5	*10.3	8	3.5	6.5	10.3	8.5	3
26	*10	3	4	* 4.5	3.5	1.5	4	2	1.5	2.5
27	*10	3.5	4.5	5.5	6.5	1.5	2	2	1	2
28	*10	3	2.5	5	2.5	1.5	2	1.5	1.5	5.5

*Deleted in initial data edit.
**UH-1B serial no. and check dates.

TABLE IX. UH-1, CONDITION METER READINGS, TAPE 111, BEARINGS NOT ON TAPE 109, FT. EUSTIS, VA., 1968

Tape	60-6032 **					65-9773					65-9770					65-9959		
Item	1/18 *	1/18	2/12 *	2/14	5/6	1/17	1/22	2/15	2/23	2/29 *	2/2	2/5	2/6	2/19	3/25	2/28	4/2	5/2
1		4.5		10.3	3	*10.3	*10.3	9.5	5.5		*7.5	*10.3	*10.3	*10.3	6	*10.3	*10.3	2.5
2		7.5		10.3	4	*10.3	*10.3	6.5	7		*10	*10.3	*10.3	*10.3	7	*10.3	*10.3	3.0
3		3.5		3	2.5	*10.3	*10.3	4.5	2.5		*3	*10.3	*6	*9.5	3.5	*5	*8.5	1.5
4		3.5		8	2.5	*10.3	*10.3	10.3	4.5		*6.5	*10.3	*10.3	*10.3	6	*10.3	*10.3	3.0
5		5		10.3	3.5	*10.3	*10.3	8.5	7		*7.5	*10.3	*10.3	*10.3	6.5	*10.3	*10.3	4.5
6		4.5		8.5	10	*10.3	*10.3	7.5	6.5		*8.5	*10.3	*10.3	*10.3	8.5	*10.3	*10.3	10.3
7		3.5		9	2.5	*10.3	*10.3	7.5	5.5		*7.5	*10.3	*10.3	*10.3	6	*7.5	*10.3	3
8		3.5		8	3	*10.3	*10.3	10.3	4.5		*10.3	*10.3	*10.3	*10.3	10.3	*10.3	*10.3	3.5
9		5.5		7.5	3	*10.3	*10.3	8	5		*10.3	*10.3	*10.3	*10.3	10.3	*10	*10.3	3.5
10		3.5		3.5	1.5	*10.3	*10.3	4.5	2.5		*9	*10.3	*9.5	*10.3	4.5	*7	*8.5	1.5
11		10.3		10.3	3.0	*10.3	*10.3	7.5	6		*8.5	*10.3	*10.3	*10.3	10.3	*10.3	*10.3	4
12		3		6.5	3.5	*10.3	*10.3	8	5.5		*10.3	*10.3	*10.3	*10.3	6	*10	*10.3	2
13		2.5		5	1.5	*9.5	*10.3	3.5	2		*10.3	*10.3	*5	*10.3	5.5	*5	*6.5	1
14		5		10.3	3.5	*10.3	*10.3	10.3	6		*9	*10.3	*10.3	*10.3	6.5	*10.3	*10.3	3
15		6.5		6.5	9.5	*10.3	*10.3	8	4		*8.5	*10.3	*10.3	*10.3	7	*10	*10.3	10.3
16		1		3	1.5	*10.3	*10.3	4	2		*10.3	*10.3	*4	*10.3	3	*6.5	*8.5	1.5
17		3		10.3	3.5	*10.3	*10.3	10.3	5.5		*10.3	*10.3	*10.3	*10.3	9	*10.3	*10.3	3
18		3		6.5	3.5	*10.3	*10.3	10.3	5.5		*10.3	*10.3	*10.3	*10.3	7.5	*10.3	*10.3	3
19		2		3	1.5	*9.5	*10.3	4.5	1.5		*9	*10.3	*4	*9.5	3	*5	*6	1
20		4.5		6	2.5	*10.3	*10.3	9.5	5.5		*10	*10.3	*10.3	*10.3	7	*7.5	*10.3	3.5
21		1.5		3	2	*9.5	*10.3	4.5	1.5		*10.3	*10.3	*4.5	*10.3	3.5	*5	*7.5	1.5
22		3.5		10.3	4	*10.3	*10.3	9	5.5		*10.3	*10.3	*10.3	*10.3	7	*10.3	*10.3	3.5
23		1.5		2.5	1.5	*10.3	*10.3	5.5	1.5		*10.3	*10.3	*4	*8.5	3	*4	*6.5	1.5
24		3		7	2.5	*10.3	*10.3	8.5	4		*10.3	*10.3	*9	*10.3	7	*10.3	*10.3	3
25		2.5		3.5	3.5	*10.3	*10.3	6.5	4.5		*10.3	*10.3	*8	*10.3	4.5	*7.5	*9.5	2.5
26		4		4.5	1.5	*10.3	*10.3	5.5	2		*10.3	*10.3	*10.3	*10.3	3.5	*8.5	*10	2.5
27		2		5.5	2	*10.3	*10.3	7.5	2.5		*10.3	*10.3	*8.5	*10.3	4.5	*6.5	*9.5	2.5
28		1.5		5.5	3	*10.3	*10.3	5.5	2.5		*10.3	*10.3	*6.5	*8.5	4.5	*7.5	*10	2

TABLE IX - Continued

Tape Item	65-9771					63-12992		65-9772			65-9740	65-9739			60-1012
	3/11	3/15	3/19	3/22	5/21	3/19	4/4	4/9	4/19	5/2	4/8	4/8	4/10	4/15 *	4/15
1	*10.3	*10.3	*10.3	2.5	*10.3	*10	2	5.5	5	5.5	7.5	3.5	5		3.5
2	*10.3	*10.3	*10.3	2	*10.3	*10	2	6.5	7.5	8.5	7.5	4	6.5		6.5
3	*3.5	*5.5	*5	1.5	*5.5	3.5	1.5	3	2	3	3.5	2.5	2.5		3
4	*6.5	*10.3	*9	2.5	*10	6.5	1.5	4	5.5	5.5	6	4.5	4.5		5
5	*10.3	*10.3	*6.5	2.5	*9.5	7.5	2.5	5	5.5	7.5	7	5.5	6		5.5
6	*10.3	*10.3	*10.3	3.5	*10.3	9.5	3	6	6	10.3	9.5	5	8		8.5
7	*6.5	*9	*9.5	1.5	*10	9.5	1.5	5.5	3	5.5	7	2.5	4		3.5
8	*10.3	*10.3	*10.3	3	*10.3	8.5	2.0	6.5	5.5	5.5	7.5	3.5	4.5		4
9	*10.3	*10.3	*10.3	4	*10.3	6	5.5	9.5	10.3	10.3	8	4	5.5		10.3
10	*4.5	*6.5	*6.5	1	*8.5	4.5	1.0	3.5	3	2.5	4.5	2	2.5		4
11	*10.3	*10.3	*9.5	2	*10.3	10.3	10.3	8.5	10.3	10.3	6.5	2.5	5.5		3.5
12	*7.5	*10.3	*10.3	2.5	*10.3	6	2	4.5	5	5	7.5	3.5	4		4
13	*3	*5	*4	1	*4.5	3.5	1	2	2	2.5	3.5	1	2.5		2.5
14	*10.3	*10.3	*10.3	3	10	10.3	2.5	5.5	4.5	3	6.5	3.5	6		4.5
15	*9.5	*10.3	*10.3	3	10.3	6	2.0	5	4.5	10.3	5.0	5	3.5		3.5
16	*4.5	*4	*4.5	1.5	4.5	4	1.0	2	2	1	3.0	1	2		2.5
17	*10.3	*10.3	*10.3	3.5	10.3	8	2	5.5	5.5	4	9.5	4	3.5		4.5
18	*10.3	*10.3	*10.3	3.5	10.3	7.5	2	5.5	6	4	5.5	3.5	4.5		4.5
19	*3.5	*4.5	*4.5	1.5	4.5	3.5	1	2.5	1.5	1.5	2.5	1.5	2		2
20	*9	*9	*8.5	3.5	10.3	5.5	2	5	5	3	6.5	3.5	4.5		3.5
21	*3.5	*4.5	*3.5	1.5	5	5	1.5	2	1.5	1.5	3	1.5	2.5		2
22	*10.3	*10.3	*9.5	2.5	10.3	10.3	2.5	5.5	5.5	3	6.5	4	5.5		3.5
23	*4	*4.5	*3.5	1.5	5.5	4	1	2.5	2	2	2.5	1.5	1.5		2.5
24	*9.5	*10.3	*10	2.5	9.5	10.3	2.5	7	10.3	3.5	4.5	4	4.5		4
25	*7.5	*10.3	*9.5	2	*8.0	4	1	4	3	3	5.0	2	3.5		3
26	*6.5	*7.5	*10.3	1.5	*6.5	4.5	2	3	2.5	1.5	3.0	1.5	2		4.5
27	*7	*10.3	*10.3	2	*10.3	9	1	2.5	2.5	1.5	4	2.5	3.5		2.5
28	*6	*7.5	*6.5	3	*9.5	4	1	3.5	2	2	4.5	4	4.5		4

*Deleted in initial data edit.

**UH-1D serial no. and check dates.

TABLE X. RPM LOCKING SUMMARY, FT. EUSTIS, VA., 1968

Tape No.	Aircraft S/N	Check Date	Aircraft Model	RPM Lock Rating N_1	RPM Lock Rating N_2	Locking Frequency N_1	Locking Frequency N_2
8-9	62-2101	19 Feb	UH-1B	Exc	Good	7006	2190
10	62-2101	23 Feb	UH-1B	Exc	Exc	7006	2193
11	61-0778	8 Mar	UH-1B	Good	Good	7029	2168
14	61-0778	28 Mar	UH-1B	Exc	Exc	7180	2205
16	63-0778	8 Apr	UH-1B	Exc	Fair	7016	2140
19	61-0713	17 Apr	UH-1B	Exc	Poor	7020	2144
20	61-0713	22 Apr	UH-1B	Exc	Good	7119	2159
20	61-0778	23 Apr	UH-1B	Exc	Good	7140	2157
22	61-0713	14 May	UH-1B	Exc	Good	7179	2120
4	65-9770	2 Feb	UH-1D	Exc	N.G.	7112	-
5	65-9770	5 Feb	UH-1D	Poor	Good	7448	2177
6	65-9770	6 Feb	UH-1D	Fair	Fair	7287	2127
7	60-6032	14 Feb	UH-1D	Exc	Poor	7205	2143
7	65-9773	15 Feb	UH-1D	-	Good	7349	2136
8-9	65-9770	19 Feb	UH-1D	Exc	Poor	7263	2134
10	65-9773	23 Feb	UH 1D	Exc	Good	6895	2129
10	65-9959	28 Feb	UH-1D	Fair	Fair	7274	2152
11	65-9771	11 Mar	UH-1D	Good	Good	7252	2089
12	65-9771	15 Mar	UH-1D	Poor	Fair	7317	2146
12	65-9771	15 Mar	UH-1D	Fair	Good	7320	2145
13	65-9771	19 Mar	UH-1D	Fair	Good	7406	2163
13	63-12992	19 Mar	UH-1D	Fair	Good	7325	2182
14	65-9771	22 Mar	UH-1D	Exc	Fair	7214	2076
14	65-9770	25 Mar	UH-1D	Good	Fair	7210	2094
15	65-9959	2 Apr	UH-1D	Fair	Fair	7335	2108
15	63-12992	4 Apr	UH-1D	Good	Good	7329	2130
16	65-9740	8 Apr	UH-1D	Fair	Fair	7355	2159
16	65-9739	8 Apr	UH-1D	Fair	Fair	7264	2127
17	65-9772	9 Apr	UH-1D	Good	Poor	7264	2082
17	65-9739	10 Apr	UH-1D	Poor	Good	7445	2175
17	66-1012	15 Apr	UH-1D	Fair	Poor	7297	2123
18	65-9739	15 Apr	UH-1D	Poor	P-N.G.	7489	2225
20	66-1012	19 Apr	UH-1D	Poor	P-G	7400	2170
21	65-9959	2 May	UH-1D	G-Exc	Good	7237	2084
21	65-9772	2 May	UH-1D	F-G	Fair	7244	2098
22	60-6032	6 May	UH-1D	Exc	P-N.G.	7149	2104
22	65-9771	21 May	UH-1D	Poor	N.G.	7306	-
23	65-9773	23 May	UH-1D	Good	Exc	7403	2155

TABLE XI. UH-1B PEAK PROBABILITY DATA, TAPE 109, XMSN AND TAIL ROTOR, FT. EUSTIS, VA., AND REPORT 68-28

Tape Item	Condition Meter Reading Units									
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10
1	12	9	6	4	2	0	1	0	0	0
2	7	9	2	8	3	4	3	0	0	0
3	12	8	6	5	1	1	0	0	0	0
4	8	4	8	4	1	1	4	0	0	0
5	4	8	3	4	3	6	5	0	0	0
6	8	12	6	7	1	0	0	0	0	0
7	10	9	5	5	2	1	2	1	0	0
8	6	7	6	4	2	4	2	0	1	1
9	6	8	5	7	2	3	5	0	1	0
10	8	8	5	4	4	3	3	0	0	0
11	12	12	6	4	1	0	0	0	0	0
12	3	5	7	6	4	6	2	1	0	0
13	5	2	1	9	1	5	4	5	1	0
14	6	2	0	8	3	4	4	7	2	0
15	4	5	7	9	5	2	0	0	0	0
16	8	6	8	4	1	4	2	0	0	0
17	11	8	7	3	0	3	0	1	0	0
18	3	2	5	4	3	3	3	1	5	2
19	3	1	4	5	4	3	3	2	7	2
20	3	8	7	5	0	3	0	2	0	0
21	2	6	7	8	3	1	0	0	0	0
22	3	4	5	8	1	3	2	0	0	1
23	13	5	5	6	0	2	0	0	0	0
24	15	7	6	1	1	3	2	0	0	0
25	8	4	4	1	2	5	0	1	1	3
26	12	4	4	8	2	1	0	0	0	1
27	7	5	6	3	5	0	1	0	0	0
28	15	5	4	2	2	2	1	0	1	0
29	7	1	4	2	1	3	3	2	1	4
30	9	12	1	2	0	1	1	0	0	0
31	6	8	8	5	2	1	2	0	0	0
32	11	7	7	8	0	2	0	0	0	0
33	7	8	7	9	2	3	0	0	0	0
34	7	4	12	9	3	1	0	0	0	0
35	7	9	8	4	2	1	0	0	0	0
36	3	3	6	4	3	1	0	0	0	0
37	5	4	5	1	4	0	1	0	0	0
38	3	8	1	1	2	1	0	0	0	0
39	1	0	2	2	3	3	1	0	0	6
40	2	6	2	1	4	1	0	1	0	0
41	3	7	0	5	1	2	0	0	0	0
42	5	6	3	3	1	0	0	1	0	0
43	4	3	4	3	10	8	1	3	0	0
44	9	9	4	7	0	3	0	3	0	0
45	12	5	7	2	2	2	1	0	0	0

TABLE XI - Continued

Tape Item	Condition Meter Reading Units									
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10
46	11		5	1	1	2	1	0	0	0
47	8		8	8	1	2	2	0	1	0
48	6	1	12	2	2	0	0	0	0	0
49	5	5	4	11	4	2	0	0	0	0
50	6	5	3	10	4	1	0	1	0	2
51	4	7	6	2	2	5	3	1	0	1
52	2	8	3	4	1	2	0	0	0	0
53	1	6	4	2	1	1	1	1	1	1
54	1	4	4	3	2	1	0	1	1	3
55	8	7	8	4	1	0	0	1	0	0
56	15	12	4	1	0	0	0	0	0	0
57	8	9	8	2	3	0	0	0	0	3
58	6	3	3	9	0	2	2	1	1	6
59	10	8	5	3	3	3	1	0	1	1

TABLE XII. UH-1D PEAK PROBABILITY DATA, TAPE 109, XMSN AND TAIL ROTOR, FT. EUSTIS, VA., 1968

Tape Item	Condition Meter Reading Units									
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10
1	0	2	4	4	3	8	3	1	2	1
2	0	1	1	7	5	9	4	0	0	0
3	1	3	6	8	3	4	3	0	0	0
4	0	2	6	2	4	1	3	3	2	4
5	0	0	0	2	2	7	2	4	3	5
6	0	0	5	2	13	4	0	1	1	0
7	0	0	2	6	6	8	4	0	0	1
8	0	0	5	3	3	4	5	4	0	1
9	0	1	2	0	3	5	4	3	3	4
10	0	0	4	5	7	8	3	0	0	1
11	0	2	6	12	6	1	1	0	0	0
12	0	2	1	6	2	6	1	2	1	5
13	0	1	1	2	2	9	4	3	4	2
14	0	0	0	0	1	6	2	4	4	0
15	2	4	5	1	1	1	1	0	1	0
16	5	3	4	3	0	2	0	0	0	0
17	3	2	4	2	2	2	1	0	0	0
18	1	1	0	2	1	3	4	2	8	5
19	0	0	0	2	0	0	3	2	9	0
20	0	3	3	4	5	1	0	0	0	0
21	0	2	8	2	2	1	1	0	0	0
22	1	4	3	2	1	2	2	1	0	0
23	6	8	6	2	4	0	0	0	0	0
24	10	1	2	1	0	0	0	0	0	0
25	9	2	1	1	2	1	0	0	0	0
26	10	1	1	0	0	0	0	0	0	0
27	8	2	1	0	0	1	0	0	0	0
28	9	2	2	1	1	1	0	0	0	0
29	7	8	3	4	1	2	0	0	0	0
30	4	0	0	0	0	0	0	0	0	0
31	9	7	1	1	4	0	1	2	0	3
32	10	8	6	0	3	1	0	0	0	0
33	8	10	5	2	1	2	0	0	0	0
34	10	5	6	0	2	0	0	0	0	0
35	8	7	5	2	1	0	0	0	0	0
36	3	7	4	4	4	1	0	0	0	0
37	8	6	5	3	2	0	0	0	0	0
38	8	6	5	2	1	0	0	0	0	0
39	0	0	0	1	0	3	1	2	4	14
40	1	3	2	5	3	4	1	1	0	8
41	3	2	4	7	5	3	0	1	0	0
42	3	9	4	4	3	2	0	0	0	0

TABLE XII - Continued

Tape Item	Condition Meter Reading Units									
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10
43	10	8	2	5	1	0	1	0	0	0
44	12	5	2	1	2	1	0	0	0	0
45	14	4	3	2	0	1	1	0	0	0
46	11	3	1	2	0	0	0	0	0	0
47	9	6	2	1	0	1	0	0	0	0
48	11	5	2	3	1	1	0	0	0	0
49	6	7	5	3	1	1	2	0	0	0
50	6	6	5	5	2	0	1	0	0	0
51	6	4	8	3	0	0	0	1	0	0
52	1	6	7	7	2	1	0	0	0	0
53	0	2	4	4	9	3	2	0	0	0
54	1	2	7	7	1	2	0	0	0	7
55	3	11	7	2	1	1	0	0	0	0
56	13	6	4	0	1	1	1	0	0	0
57	4	6	5	3	1	2	0	0	1	3
58	6	10	3	3	1	2	0	0	0	0
59	14	6	1	0	1	0	0	0	0	0

TABLE XIII. UH-1B PEAK PROBABILITY DATA, TAPE 110, T53-L-11 ENGINES, FT. EUSTIS, VA., 1968

Tape Item	Condition Meter Reading Units									
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10
1	0	1	1	5	1	1	1	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	2	0	0	0	0	0	0	0	0	0
4	0	6	1	1	0	0	0	0	0	0
5	1	3	3	0	0	0	0	0	0	1
6	0	2	3	1	1	0	0	0	0	1
7	1	2	1	2	1	0	0	0	1	0
8	1	1	4	2	0	0	0	0	0	0
9	3	0	3	1	1	0	0	0	0	0
10	1	0	5	0	1	0	0	0	0	0
11	0	3	1	1	0	1	0	1	0	0
12	1	1	2	2	0	1	0	0	0	0
13	2	2	3	1	0	0	0	0	0	0
14	1	0	1	2	0	3	0	0	0	0
15	0	1	0	5	1	1	0	0	0	0
16	1	4	1	1	1	0	0	0	0	0
17	0	1	0	3	1	0	2	1	0	0
18	0	1	2	0	2	2	0	0	0	1
19	1	2	1	2	0	1	0	1	0	0
20	0	2	1	0	0	3	0	1	1	0
21	3	0	1	2	1	1	0	0	0	0
22	0	0	1	1	3	2	0	0	0	1
23	0	2	3	1	0	1	1	0	0	0
24	0	1	1	1	2	1	2	0	0	0
25	0	3	0	3	2	0	0	0	0	0
26	0	1	1	5	1	0	0	0	0	0
27	0	1	1	4	2	0	0	0	0	0
28	0	3	1	1	2	1	0	0	0	0
29	0	4	1	2	1	0	0	0	0	0
30	0	1	0	0	1	2	2	0	0	2
31	1	0	4	1	2	0	0	0	0	0
32	0	1	0	2	1	1	0	1	0	2
33	0	0	3	4	1	0	0	0	0	0
34	0	1	0	2	1	0	1	2	1	0
35	0	3	3	2	0	0	0	0	0	0
36	0	3	1	3	0	0	0	1	0	0
37	1	0	0	1	2	1	1	1	1	0
38	0	1	3	0	2	1	0	0	0	0
39	2	3	0	2	1	0	0	0	0	0
40	0	0	2	2	0	1	1	1	0	1
41	3	2	2	1	0	0	0	0	0	0
42	1	0	2	3	2	0	0	0	0	0

TABLE XIV. UH-1D PEAK PROBABILITY DATA, TAPE 110, T53-L-11 ENGINES, FT. EUSTIS, VA., 1968

Tape Item	Condition Meter Reading Units									
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10
4	4	7	9	0	4	2	1	0	0	0
5	3	8	7	4	3	1	0	0	0	1
6	4	6	5	7	2	2	0	1	0	0
7	4	3	5	7	4	2	0	1	0	0
8	6	4	5	7	3	1	2	0	0	0
9	11	5	6	2	1	0	1	0	0	0
10	6	4	3	7	5	2	0	1	0	0
11	3	4	4	6	5	3	0	1	1	0
12	6	2	1	8	6	2	2	0	0	0
13	3	3	8	2	5	2	3	1	0	0
14	1	3	4	8	6	2	2	0	2	0
15	3	2	2	8	7	2	3	0	0	0
16	4	1	7	9	2	2	1	1	0	0
17	1	4	4	2	6	5	3	1	2	0
18	1	2	6	6	7	2	1	0	0	3
19	6	1	4	5	5	0	2	0	1	3
20	2	4	1	4	1	3	2	1	5	5
21	5	8	2	4	3	0	2	0	1	2
22	0	2	5	5	4	4	5	1	1	0
23	2	4	1	5	4	4	3	2	3	0
24	2	3	1	4	2	4	4	1	6	1
25	4	4	9	7	0	1	2	0	0	0
26	4	2	6	7	5	1	2	0	1	0
27	1	2	1	7	6	5	2	3	0	0
28	0	3	5	6	5	5	0	2	0	1
29	1	3	5	8	6	1	1	0	0	0
30	1	2	2	3	6	6	3	3	1	0
31	2	3	5	4	7	2	2	0	0	0
32	0	3	4	9	6	3	1	0	0	0
33	1	4	8	7	3	1	2	0	0	0
34	1	2	4	1	1	1	4	7	3	3
35	2	5	4	6	8	1	0	0	0	0
36	1	5	5	10	3	1	0	2	0	0
37	1	2	1	4	1	2	5	3	4	3
38	1	5	2	2	4	9	0	1	1	2
39	1	7	9	5	2	2	0	0	0	0
40	0	4	2	5	7	4	3	0	0	1
41	4	5	6	5	2	2	1	1	0	0
42	3	2	3	7	5	6	0	0	1	0

TABLE XV. UH-1B PEAK PROBABILITY DATA, TAPE 111, OTHER XMSN BEARINGS, FT. EUSTIS, VA., 1968

Tape Item	Condition Meter Reading Units									
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10
1	2	2	0	1	2	1	0	0	0	0
2	1	2	0	1	0	1	3	0	0	0
3	3	3	3	0	0	0	0	0	0	0
4	4	1	3	1	0	0	0	0	0	0
5	0	1	6	0	0	0	0	0	0	0
6	2	0	1	4	0	0	0	1	0	0
7	1	2	1	1	0	0	1	0	1	2
8	0	2	2	2	1	1	1	0	0	0
9	0	1	3	3	1	0	0	0	0	0
10	1	0	3	1	1	0	0	0	0	3
11	1	3	2	0	2	0	1	0	0	0
12	1	3	0	3	1	0	0	0	0	0
13	4	1	0	1	1	0	0	0	0	0
14	1	1	1	2	0	0	0	0	0	4
15	2	2	1	4	0	0	0	0	0	0
16	4	3	2	0	0	0	0	0	0	0
17	1	2	2	3	0	1	0	0	0	0
18	1	3	0	2	1	2	0	0	0	0
19	4	1	1	2	0	1	0	0	0	0
20	4	0	3	2	0	0	0	0	0	0
21	3	1	0	1	0	1	1	0	0	0
22	0	1	0	0	1	0	0	0	1	6
23	5	3	0	0	0	0	0	0	0	0
24	1	2	1	4	0	0	1	0	0	0
25	0	1	2	0	0	2	1	1	0	1
26	3	2	3	0	0	0	0	0	0	0
27	4	0	1	1	1	1	0	0	0	0
28	4	3	0	1	1	0	0	0	0	0

TABLE XVI. UH-1D PEAK PROBABILITY DATA, TAPE 111, OTHER XMSN BEARINGS, FT. EUSTIS, VA., 1968

Tape Item	Condition Meter Reading Units									
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10
1	1	3	2	3	4	0	1	0	1	1
2	2	1	2	0	0	6	3	1	0	1
3	4	8	4	1	0	0	0	0	0	0
4	1	3	2	4	4	1	1	0	0	1
5	0	2	1	3	4	3	2	1	0	1
6	0	1	1	2	2	1	2	3	3	2
7	2	4	3	0	4	1	1	1	1	0
8	1	2	4	2	2	1	2	1	0	2
9	0	1	3	1	4	0	3	0	1	4
10	3	4	4	4	0	0	0	0	0	0
11	1	2	2	0	2	1	1	1	0	7
12	2	2	4	3	3	1	2	0	0	0
13	4	4	3	1	1	0	0	0	0	0
14	0	4	2	3	3	2	0	0	0	4
15	1	2	3	4	1	2	1	0	1	3
16	7	4	2	1	0	0	0	0	0	0
17	1	2	5	1	3	0	1	1	1	3
18	1	2	4	2	4	1	2	0	0	2
19	9	4	1	2	0	0	0	0	0	0
20	1	2	4	4	3	2	0	0	1	1
21	11	3	1	3	0	0	0	0	0	0
22	0	3	5	0	4	2	0	1	0	3
23	9	5	1	0	2	0	0	0	0	0
24	0	5	4	2	0	3	0	1	1	2
25	2	5	5	3	0	1	0	0	0	0
26	7	4	2	3	1	0	0	0	0	0
27	4	6	2	1	1	0	1	1	0	0
28	4	3	4	3	2	0	0	0	0	0

TABLE XVII. UH-1B TEARDOWN INSPECTION VS CONDITION METER READINGS (BASED ON PRELIMINARY LIMITS)

	Helicopter Serial Number							
	61-0745		61-0730		61-0724		62-1964	
Component	CMR	TI	CMR	TI	CMR	TI	CMR	TI
Transmission								
Gear	NG	OK	NG	NG	-	-	NG	M
Bearing	NG	RNG	F	OK	-	-	NG	NG
90° Gearbox								
Gear	NG	NG	M-NG	M	NG	NG	-	-
Bearing	OK	OK	OK	OK	NG	OK	-	-
42° Gearbox								
Gear	NG	OK	NG	OK	-	-	-	-
Bearing	OK	OK	NG	OK	-	-	-	-

Legend:

CMR - Condition Meter Reading
TI - Teardown Inspection
NG - Reject
RNG - Related Component Reject
M - Marginal
F - Fluctuating Reading
OK - Satisfactory

TABLE XVIII. SAMPLE OF DATA EDIT DELETIONS, UH-1B HELICOPTERS, TAPE 109

Tape Item	Aircraft No.	Reason
1	None	
2	None	
3	None	
4	0730 (1)	Teardown inspection results.
	2101 (2/19)	New quill installed; checked OK 2/23.
5	0730 (2)	Teardown inspection.
	0713 (5/14)	Only one of ten exceed, and reading had been changed from 7.5 on data sheet.
6	None	
7	0730 (2)	Teardown inspection results.
	1888 (1)	Suspect bad reading since third harmonic (Item 8) reads a very normal 4.0. Also, no TSO or teardown records.
8	0730 (2)	Teardown inspection results.
	0730 (3)	Teardown inspection results.
9	3562 (1)	Only one of 37 checks which is more than 7.5. Also, same engine shows normal on two later checks.
10	0778 (4/23)	Creep increment increase on five successive checks from 4.5 on 2/23/68 to 8.5 on 4/23/68 implies a failing component. No teardown inspection available.
11	None	
12	0713 (4/23)	One check before and one after this check read normal.
13	0713 (4/23)	Same as 12 above.
	0730 (3)	Teardown inspection results.
14	-	Record only for sideband check reference.
15	0724 (1)	Teardown inspection results.
	0745 (1)	Fundamental too low (1.5) for dependable reference.
	1954 (1)	Fundamental too low (3.0) for dependable reference.
	0745 (3)	Fundamental too low (0.5) for dependable reference.
	3562 (3)	Fundamental too low (1.5) for dependable reference.
	0741 (1)	Fundamental too low (1.0) for dependable reference.

TABLE XIX. SAMPLE OF DATA EDIT DELETIONS, UH-1D HELICOPTERS, TAPE 109

Tape Item	Aircraft No.	Reason
All All	9773 (1/17) 9773 (1/22)	After these runs, which showed considerably high readings (especially in bearing areas), the transmission mounts were retorqued, the collector was adjusted, the input quill and short shaft were replaced, etc. Checks on 2/15, 2/23, and 2/29 following above work show normal readings. Check of tapes shows good to excellent locks on the 2/15 and 2/23 runs. Tape playback of the 2/23 run correlates the initial live readings except for item 39, which reads 10.0 instead of 4.5, but item 39 exceeds limit in 27 out of 33 other aircraft checks and requires detailed investigation.
68 525354	12992 (3/19)	Playback reveals most of items have outside static interference (can hear on tape) which pegs indicator. When static is not present, readings are normal. Remainder of items were playback readings. N_1 and N_2 locks are fair to good.
All	9771 (5/21)	Check of tape shows no lock on N_2 and poor lock on N_1. Relatively high noise levels (3.5 and 5.0). Detuned for N_2. Spot check items 1, 14, and 12, which were pegged in original data, show 3.0, 3.5 and 6.0 respectively.
All that exceed limits	9771 (3/11) 9771 (3/15) 9771 (3/19)	This aircraft was suspected acoustically from initial check on 3/11/68. The 3/15 check continued to show same results. After the 3/19 check showed same high indications, the helicopter was assigned to ARB for a complete check of gear train system. Found: 1. Loose transmission mount bolts 2. Engine-transmission misaligned 1/16 inch 3. Engine to short shaft adapter mounting bolt found finger tight and excessive end play 4. Main rotor blades 1-1/2 inch out of track Following above maintenance, a check on 3/22/68 showed normal readings. Therefore, any readings that exceeded limits on the 3/11, 3/15 and 3/19 checks for this aircraft were deleted from use for determining limits.

Revised Tape Selection and Identification

Early in the program it became apparent that the peak probability printout analysis was indicating the need for different gain settings for some components on the UH-1D than for the UH-1A, -1B, and -1C models. The differences were predominant in the transmission components.

A review of the microphone locations and the mechanical design appeared to substantiate the differences. Examination of the required microphone locations as shown in Figures 6 and 7, Section I, and Figures 10 and 11, Section III of the UH-1 Acoustic Handbook, shows considerable differences in locations except for the tail rotor components microphone No. 3. Also, examination of the transmission mechanical schematics of Figures 7 and 8, Section III of the Handbook, shows differences in the arrangement of the components, especially in the generator drive section. Because of these differences, the gain settings would not necessarily be expected to remain the same except possibly for the tail rotor components, which do not appear on a tape by themselves.

Following this review the tape identification list was revised to reflect standard Curtiss-Wright acoustic 5200 series numbers as shown in Table I along with titles and a cross index to the original tape numbers.

RPM Tracking Speeds

There does not appear to be any need to use difference N_2 settings among the various models of the UH-1. This commonality permits the continued use of the single analyzer module for all UH-1 aircraft.

In the case of N_1, which does not affect the module but only the program tape, a change was required for the UH-1D model. In playing back the Ft. Eustis data tapes, it became apparent that in order to obtain a lock on N_1, it was necessary to manually detune the module from the nominal 7042 c.p.s. locking frequency. In comparing the original nominal locking frequencies of 7042 c.p.s. for N_1 and 2175 c.p.s. for N_2 with actual locking frequencies as shown in Table X, it became apparent when locked that:

1. N_1 on the UH-1D models was running high.
2. N_1 on the UH-1A, -1B, and -1C was running within limits.
3. N_2 on the UH-1D models was running within limits.
4. N_2 on the UH-1A, -1B, and -1C models was running within limits.

In summary, only N_1 for the UH-1D model was running outside the nominal limits, where it was averaging about 7300 c.p.s. instead of the nominal 7042 c.p.s. To reflect this change, the octal ratio for N_1 for the UH-1D tape was changed from 0.3321 to 0.3223; all others remained unchanged. This updated tracking data is summarized in Table XX.

TABLE XX. RPM TRACKING INFORMATION, UH-1 HELICOPTERS

Helicopter Model	N_1 % RPM	N_1 c.p.s. Freq.	N_1 Octal Ratio	N_2 RPM	N_2 c.p.s. Freq.	N_2 Octal Ratio
UH-1A, -1B, -1C						
Minimum	57.0	6688	0.3321	4300	2079	0.3533
Nominal	60.0	7042	0.3321	4500	2175	0.3533
Maximum	63.0	7396	0.3321	4700	2271	0.3533
UH-1D						
Minimum	59.2	6947	0.3223	4300	2079	0.3533
Nominal	62.2	7300	0.3223	4500	2175	0.3533
Maximum	65.2	7651	0.3223	4700	2271	0.3533

Limit and Other Tape Revisions

General Policy

Before getting into procedures for the revisions, it seems appropriate to present the current general policy of Curtiss-Wright on selecting sonic analyzer limits which are based on field experience to date.

There is a general consensus that the meter range above 5.0 decibels is presently set unnecessarily sensitive. A slight change in decibels of the input signal results in a considerable increase in scale reading (voltage). This degree of sensitivity is not required to detect a defective component and could or may exaggerate small normal variations in the sound level of the component. The opinion seems verified by the fact that in all or nearly all cases in which a component was found defective by teardown inspection following a "high" meter reading, the "high" was "pegged" well beyond the limit of the meter scale.

The policy, therefore, is to decrease limits somewhat more than in the past to reduce this over-sensitivity. It is not unique to the UH-1 of this report but applies to current CH-46 limit revisions and any future revisions to other aircraft.

Procedures

After the initial rough edit of all the data, the peak probability printouts were processed. These printouts, shown in Tables XI through XVI, served as the starting point and general reference for limit revisions.

The printouts made obvious the section of the meter scale where the peak number of readings occurred, the number of readings that exceeded the limit of 8.0, and the general mathematical distribution of the checks throughout the full meter range.

Any unusual variations from the normal peak probability type curve stood out readily and thus pointed out areas requiring detailed investigation to determine how influential, if at all, they should be in the limit revision decisions. For example, one component may show a great many checks peaking at a meter reading of 5 with a definite normal fall-off to 0 at a meter reading of 8 and continuing at 0 up to a meter reading of 10, but then 1 or 2 checks may show meter readings of greater than 10. This would immediately indicate a detailed investigation of the data showing readings greater than 10, since they stood alone among zeros and off the normal probability curve, which made them appear suspicious as qualifying data. It is at this point that the decisionmaking aids previously discussed were applied in detail. Usually the investigation was conclusive, but sometimes the distribution data were not as good; also, detailed investigation sometimes did not disclose any real conclusive evidence, but at least it did provide a helpful procedure by which to approach the decisionmaking problem of limit revisions.

Six overlay decibel-voltage equivalent cards, scaled to match the digital printout scaling, were made up for each of the six highest increment units (5, 6, 7, 8, 9 and 10). By selecting the appropriate card (dependent on the increment unit from which the limit reduction is to be made) and overlaying it on the printout component of interest at the time, the change was read in decibels for direct application to gain setting revisions.

Each component of each of the six tapes (Tables XXI through XXVI) was reviewed in the above manner to arrive at the revised gain settings. This represents a considerable number of component checks (approximately 250). For this reason, some selected components were investigated in more detail than others. These included mainly those components on tapes 5210 and 5240 which represent a selected group of transmission and tail rotor components including the primary drive gears. With only several exceptions, to be discussed later, all the components and their revised gain settings should result in:

1. Justification for a more detailed investigation of any readings which exceed limits, especially if the meter reads off scale.

2. Increased confidence level in the sonic analyzer.

Two especially troublesome areas were encountered on tapes 5210 and 5240. One generated around item 39 of tape 109, which is item 50 of the revised tape. This is a low-frequency (80-c.p.s.) check of the $3f_B'$ signal for the main rotor shaft upper support bearing No. 37. The other area involved the sideband items for the 42° and 90° tail rotor gearbox bevel gears.

All the signals for the No. 37 bearing mentioned above as well as some of those for bearing No. 39 were of very low frequencies (26 to 80 c.p.s.), and the background noise appeared to have considerable variations in this frequency range. Because of this, it was difficult to judge the authenticity of a great deal of the data. It appears that a complete field investigation and evaluation of the noise level in this range would be appropriate and advantageous. The investigation would consist of recording over a period of time the variations in noise and discrete signals for the involved frequencies and, depending on the data results, devising a better means (such as possibly a signal-to-noise ratio limit) for checking these particular bearings. Also, it might prove advantageous to use several different normalization settings, instead of the present one, to compensate for possible noise variation through the frequency spectrum.

Sideband and harmonic signals for the 42° and 90° gearbox bevel gears were treated separately from the remainder of the component items because they are relatively few in number and are usually thought of in terms of their relative, rather than their absolute, values. The

mathematics for them was performed manually rather than by the digital computer program. From the results, it was decided that the present data are unsatisfactory for making any rejection criteria decisions mainly because of:

1. Wide inconsistencies among the data.

2. High data deletion rates, leaving only a small amount of data to work with.

3. Skepticism as to the method, in this particular case, of relating sideband and harmonics to the fundamental.

As a result of the above, it was decided that these tests were insufficiently developed at present for dependable automatic operation with the tape. Therefore, the actions described in the next paragraphs are intended primarily to retain a good reject check on the gearbox fundamental signal. At the same time they would set up the remainder of the items so that future data obtained will be more meaningful for modifying the present method of relating sideband and harmonics to the fundamental or for developing a new method (such as considering the total energy being expelled, whether it is in the form of fundamentals, sidebands, harmonics, or combinations of these). The changes made were:

1. The gain settings were updated for the fundamental absolute value reject check to retain direct monitoring of the gearboxes. (Items 21A and 26A of tapes 5210 and 5240)

2. The gain settings for the reference value of the fundamental signal were adjusted to provide a normally higher reading than in 1 above to assure a consistently strong signal to relate to sidebands and harmonics. (Items 21C and 26C of tapes 5210 and 5240)

3. The gain settings for the sidebands and harmonics were updated to provide normal readings to relate to the reference fundamental. (Items 27, 28 and 29 of tapes 5210 and 5240)

4. The noise checks were retained to provide noise data for analysis of future data. (Items 21B and 26B of tapes 5210 and 5240)

5. All items were removed (temporarily) from the "automatic" to the "read" code of operation.

With future data collected per the above program modifications, it is anticipated that a sideband, harmonic, fundamental relationship can be worked out that will provide dependable automatic monitoring of these signals.

In addition to the revisions discussed above, several lock checks were added to the revised tapes to provide more dependability for future data.

TABLE XXI. ACOUSTIC LOG SHEETS, UH-1A, -1B, -1C, XMSN AND TAIL ROTOR, SONIC ANALYZER PROGRAM NO. 5210

Item No.	Component Description	Mode	Mic	Chan	Lock N	Ratio Set	Gains I-II	Cond Limit
1	Start	0	0	0	1	0.0000	0- 0	Start
2	Clear	0	0	0	1	0.0000	0- 0	Clear
3	N1 CAL	0	0	0	1	0.3321	5- 5	Set Max
4	N2 Cal	0	0	0	2	0.3533	5- 5	Set Max
5	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
6	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
7	Mic No. 3 Norm	0	3	3	1	1.1223	5-25	Set 5
8	Brg 46 Tail Dr F1	0	3	3	2	0.0304	3- 0	Read
9	F2	0	3	3	2	0.0215	0- 0	Read
10	FB'	0	3	3	2	0.0266	3- 0	Read
11	3FB'	0	3	3	2	0.1043	3-10	Read
12	Brg 42 42° Gearbox F1	0	3	3	2	0.0376	1-10	Read
13	F2	0	3	3	2	0.0257	3- 0	Read
14	FB'	0	3	3	2	0.0241	3- 0	Read
15	3FB'	0	3	3	2	0.0743	5- 0	Read
16	Mic No. 3 Norm	0	3	3	1	1.1223	5-25	Set 5
17	Brg 43 42-90° Gearbox F1	0	3	3	2	0.0341	5- 5	Read
18	F2	0	3	3	2	0.0217	0- 0	Read
19	FB'	0	3	3	2	0.0203	0- 0	Read
20	3FB'	0	3	3	2	0.0611	2-10	Read
21	A Bevel Gear 42° Gearbox	0	3	3	2	0.1474	0- 0	Read
21	B Noise Check	0	3	3	2	0.1553	4- 0	Read
21	C Bevel Gear 42° Gearbox	0	3	3	2	0.1474	4- 0	Read
22	-FR	0	3	3	2	0.1436	1- 0	Read
23	+FR	0	3	3	2	0.1533	1- 0	Read
24	Fund X2	0	3	3	2	0.3171	1- 0	Read
25	Mic No. 3 Norm	0	3	3	1	1.1223	5-25	Set 5
26	A Bevel Gear 90° Gearbox	0	3	3	2	0.0714	0- 0	Read
26	B Noise Check	0	3	3	2	0.0733	1- 0	Read
26	C Bevel Gear 90° Gearbox	0	3	3	2	0.0714	1- 0	Read
27	-FR	0	3	3	2	0.0655	0- 0	Read
28	+FR	0	3	3	2	0.0753	0- 0	Read
29	Fund X2	0	3	3	2	0.1630	0- 0	Read
30	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
31	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
32	Rotor Lo Sp Gears 10-11-12	0	1	1	2	0.0423	3-15	Read
33	Fund X2	0	1	1	2	0.1046	1-15	Read
34	Output Dr Gr 15-16-17	0	1	1	2	0.1435	0-15	Read
35	Fund X2	0	1	1	2	0.3072	0-15	Read
36	Rotor Hi Sp Gears 7-8-9	0	1	1	2	0.1520	3-15	Read

TABLE XXI - Continued

Item No.	Component Description	Mode	Mic	Chan	Lock N	Ratio Set	Gains I-II	Cond Limit
37	Offset Spur 13-14	0	1	1	2	0.2273	1-15	Read
38	Input Dr Bev Gr 1-2-3	0	1	1	2	0.2525	0-15	Read
39	Fund X2	0	1	1	2	0.5253	3-10	Read
40	Oil Pump	0	1	1	2	0.0166	2-10	Read
41	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
42	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
43	Brg Swashplate 48 F1	0	1	1	2	0.0145	3-10	Read
44	F2	0	1	1	2	0.0137	3-10	Read
45	FB'	0	1	1	2	0.0107	4- 5	Read
46	3FB'	0	1	1	2	0.0325	4-15	Read
47	Brg Upper Rotor 37 F1	0	1	1	2	0.0032	2-20	Read
48	F2	0	1	1	[illegible]	0.0024	2-20	Read
49	FB'	0	1	1	2	0.0021	2-20	Read
50	3FB'	0	1	1	2	0.0062	3-15	Read
51	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
52	Brg Lower Rotor 39 F1	0	1	1	2	0.0043	2-20	Read
53	F2	0	1	1	2	0.0035	2-20	Read
54	FB'	0	1	1	2	0.0031	2-20	Read
55	3FB'	0	1	1	2	0.0112	4- 5	Read
56	Brg Input Quill 23 F1	0	1	1	2	0.1056	1-20	Read
57	F2	0	1	1	2	0.0736	2-20	Read
58	FB'	0	1	1	2	0.1133	2-20	Read
59	3FB'	0	1	1	2	0.3421	1-20	Read
60	Brg Tail Rotor 43 F1	0	1	1	2	0.0341	4-15	Read
61	F2	0	1	1	2	0.0217	3-15	Read
62	FB'	0	1	1	2	0.0203	3-15	Read
63	3FB'	0	1	1	2	0.0611	2-25	Read
64	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
65	Brg Rotor Lo Sp 36 F1	0	1	1	2	0.0072	3-15	Read
66	F2	0	1	1	2	0.0065	3-15	Read
67	FB'	0	1	1	2	0.0055	3-15	Read
68	3FB'	0	1	1	2	0.0210	3-15	Read
69	Brg Lower Input 41 F1	0	1	1	2	0.0365	5-15	Read
70	F2	0	1	1	2	0.0251	3-15	Read
71	FB'	0	1	1	2	0.0234	4-10	Read
72	3FB'	0	1	1	2	0.0722	2-20	Read

TABLE XXII. ACOUSTIC LOG SHEETS, UH-1A, -1B, -1C, ENGINE COMPONENTS, SONIC ANALYZER PROGRAM NO. 5220

Item No.	Component Description	Mode	Mic	Chan	Lock N	Ratio Set	Gains I-II	Cond Limit
1	Start	0	0	0	1	0.0000	0- 0	Start
2	Clear	0	0	0	1	0.0000	0- 0	Clear
3	N1 Cal	0	0	0	1	0.3321	5- 5	Set Max
4	N2 Cal	0	0	0	2	0.3533	5- 5	Set Max
5	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
6	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
7	Mic No. 2 Norm	0	2	2	1	1.1223	5-25	Set 5
8	No. 2 Compr Fund	0	2	2	1	1.0000	3-10	Read
9	-FR	0	2	2	1	0.7556	3-10	Read
10	+FR	0	2	2	1	1.0222	3-10	Read
11	No. 1 Main Brg Fl	0	2	2	1	0.2142	2-25	Read
12	F2	0	2	2	1	0.1413	2-25	Read
13	FB'	0	2	2	1	0.1420	2-25	Read
14	3FB'	0	2	2	1	0.4462	2-25	Read
15	No. 1 Main Brg Opt Fl	0	2	2	1	0.2272	2-25	Read
16	F2	0	2	2	1	0.1506	2-25	Read
17	3FB'	0	2	2	1	0.4444	2-25	Read
18	No. 2 Main Brg Fl	0	2	2	1	0.3155	2-20	Read
19	F2	0	2	2	1	0.2400	5-20	Read
20	FB'	0	2	2	1	0.2210	5-20	Read
21	3FB'	0	2	2	1	0.6631	2-25	Read
22	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
23	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
24	Mic No. 2 Norm	0	2	2	1	1.1223	5-25	Set 5
25	No. 2 Main Brg Opt Fl	0	2	2	1	0.2450	2-20	Read
26	FB'	0	2	2	1	0.2146	2-25	Read
27	3FB'	0	2	2	1	0.6463	2-25	Read
28	Oil Pump Vane 27	0	2	2	1	0.0137	2-15	Read
29	Oil Pump Gear 27	0	2	2	1	0.0355	3-20	Read
30	Fuel Cont Pump Gr 25	0	2	2	1	0.0370	1-25	Read
31	Fc Accy Dr Gr 26	0	2	2	1	0.0565	2-25	Read
32	Fc Main Dr Gr 22-23-24	0	2	2	1	0.1352	3-20	Read
33	N1 Tach Dr Gr 6-7	0	2	2	1	0.1640	2-25	Read
34	Spur Idler Gr 4B-5-8	0	2	2	1	0.1742	2-25	Read
35	Fc Dr Gr 9-10	0	2	2	1	0.1772	3-20	Read
36	Bev Dr Gr ADGB 3-4A	0	2	2	1	0.3172	2-20	Read
37	Mic No. 2 Norm	0	2	2	1	1.1223	5-25	Set 5
38	No. 3 Main Brg Fl	0	2	2	2	0.3241	3-20	Read
39	F2	0	2	2	2	0.2451	3-20	Read
40	FB'	0	2	2	2	0.2255	3-20	Read
41	3FB'	0	2	2	2	0.7007	1-25	Read
42	No. 4 Main Brg Fl	0	2	2	2	0.2206	5-20	Read
43	F2	0	2	2	2	0.1444	3-20	Read

TABLE XXII - Continued

Item No.	Component Description	Mode	Mic	Chan	Lock N	Ratio Set	Gains I-II	Cond Limit
44	FB'	0	2	2	2	0.1451	3-20	Read
45	3FB'	0	2	2	2	0.4574	5-20	Read
46	No. 4 Main Brg Opt Fl	0	2	2	2	0.2341	5-20	Read
47	F2	0	2	2	2	0.1540	5-20	Read
48	3FB'	0	2	2	2	0.4556	5-20	Read
49	Mic No. 2 Norm	0	2	2	1	1.1223	5-25	Set 5
50	ADGB Bev Dr Gr 7-8	0	2	2	2	0.1127	3-25	Read
51	ADGB Bev Dr Gr 9-10	0	2	2	2	0.1167	5-25	Read
52	ADGB Idler Gr 11-12-13	0	2	2	2	0.1644	1-25	Read
53	Output Lo Sp Gr 3-4	0	2	2	2	0.3022	2-20	Read
54	Output Hi Sp Gr 1-2	0	2	2	2	0.6141	3-20	Read

TABLE XXIII. ACOUSTIC LOG SHEETS, UH-1A, -1B, -1C, OTHER XMSN BEARINGS, SONIC ANALYZER PROGRAM NO. 5230

Item No.	Component Description	Mode	Mic	Chan	Lock N	Ratio Set	Gains I-II	Cond Limit
1	Start	0	0	0	1	0.0000	0- 0	Start
2	Clear	0	0	0	1	0.0000	0- 0	Clear
3	N_1 Cal	0	0	0	1	0.3321	5- 5	Set Max
4	N_2 Cal	0	0	0	2	0.3533	5- 5	Set Max
5	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
6	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
7	Input Quill Sft Brg 24 F1	0	1	1	2	0.0641	2-25	Read
8	F2	0	1	1	2	0.0441	4-20	Read
9	3FB'	0	1	1	2	0.1366	2-25	Read
10	Lower Trans Brg 40 F1	0	1	1	2	0.0331	5-15	Read
11	F2	0	1	1	2	0.0212	5-15	Read
12	FB'	0	1	1	2	0.0176	5-15	Read
13	3FB'	0	1	1	2	0.0573	2-20	Read
14	Lower Trans Brg 42 F1	0	1	1	2	0.0376	5-15	Read
15	F2	0	1	1	2	0.0257	3-15	Read
16	3FB'	0	1	1	2	0.0744	5-20	Read
17	Input Quill Sft Brg 25 F1	0	1	1	2	0.0527	5-20	Read
18	F2	0	1	1	2	0.0336	5-15	Read
19	3FB'	0	1	1	2	0.1161	5-20	Read
20	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
21	Brg 25 Opt F1	0	1	1	2	0.0474	2-20	Read
22	F2	0	1	1	2	0.0312	5-15	Read
23	3FB'	0	1	1	2	0.1147	5-20	Read
24	Main Bev Gr Brg 26 F2	0	1	1	2	0.0403	5-15	Read
25	FB'	0	1	1	2	0.0346	5-15	Read
26	3FB'	0	1	1	2	0.1263	4-20	Read
27	Brg 26 Opt FB'	0	1	1	2	0.0323	5-15	Read
28	3FB'	0	1	1	2	0.1171	4-25	Read
29	Main Bev Gr Brg 27 F2	0	1	1	2	0.0503	2-20	Read
30	3FB'	0	1	1	2	0.1415	4-25	Read
31	1st Stg Carrier Brg 34 F1	0	1	1	2	0.0264	3-15	Read
32	Lower Trans Brg 38 F1	0	1	1	2	0.1053	1-20	Read
33	F2	0	1	1	2	0.0766	5-20	Read
34	FB'	0	1	1	2	0.0670	5-20	Read
35	3FB'	0	1	1	2	0.2421	5-25	Read

TABLE XXIV. ACOUSTIC LOG SHEETS, UH-1D, XMSN AND TAIL ROTOR, SONIC ANALYZER PROGRAM NO. 5240

Item No.	Component Description	Mode	Mic	Chan	Lock N	Ratio Set	Gains I-II	Cond Limit
1	Start	0	0	0	1	0.0000	0- 0	Start
2	Clear	0	0	0	1	0.0000	0- 0	Clear
3	N1 Cal	0	0	0	1	0.3223	5- 5	Set Max
4	N2 Cal	0	0	0	2	0.3533	5- 5	Set Max
5	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
6	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
7	Mic No. 3 Norm	0	3	3	1	1.1223	5-25	Set 5
8	Brg 46 Tail Dr F1	0	3	3	2	0.0304	1- 0	Read
9	F2	0	3	3	2	0.0215	0- 0	Read
10	FB'	0	3	3	2	0.0266	1- 0	Read
11	3FB'	0	3	3	2	0.1043	2-10	Read
12	Brg 42 42° Gearbox F1	0	3	3	2	0.0376	4- 5	Read
13	F2	0	3	3	2	0.0257	1- 0	Read
14	FB'	0	3	3	2	0.0241	3- 0	Read
15	3FB'	0	3	3	2	0.0743	5- 0	Read
16	Mic No 3 Norm	0	3	3	1	1.1223	5-25	Set 5
17	Brg 43 42°-90° Gearbox F1	0	3	3	2	0.0341	2- 5	Read
18	F2	0	3	3	2	0.0217	0- 0	Read
19	FB'	0	3	3	2	0.0203	0- 0	Read
20	3FB'	0	3	3	2	0.0611	4- 5	Read
21	A Bevel Gear 42° Gearbox	0	3	3	2	0.1474	0- 0	Read
21	B Noise Check	0	3	3	2	0.1553	4- 0	Read
21	C Bevel Gear 42° Gearbox	0	3	3	2	0.1474	4- 0	Read
22	-FR	0	3	3	2	0.1436	1- 0	Read
23	+FR	0	3	3	2	0.1533	1- 0	Read
24	Fund X2	0	3	3	2	0.3171	1- 0	Read
25	Mic No. 3 Norm	0	3	3	1	1.1223	5-25	Set 5
26	A Bevel Gear 90° Gearbox	0	3	3	2	0.0714	0- 0	Read
26	B Noise Check	0	3	3	2	0.0773	1- 0	Read
26	C Bevel Gear 90° Gearbox	0	3	3	2	0.0714	1- 0	Read
27	-FR	0	3	3	2	0.0655	0- 0	Read
28	+FR	0	3	3	2	0.0753	0- 0	Read
29	Fund X2	0	3	3	2	0.1630	0- 0	Read
30	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
31	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
32	Rotor Lo Sp Gears 10-11-12	0	1	1	2	0.0423	4-15	Read
33	Fund X2	0	1	1	2	0.1046	1-15	Read
34	Output Dr Gr 15-16-17	0	1	1	2	0.1435	0-15	Read
35	Fund X2	0	1	1	2	0.3072	0-15	Read
36	Rotor Hi Sp Gears 7-8-9	0	1	1	2	0.1520	3-15	Read
37	Offset Spur 13-14	0	1	1	2	0.2273	3-15	Read
38	Input Dr Bev Gr 1-2-3	0	1	1	2	0.2525	3-15	Read

TABLE XXIV - Continued

Item No.	Component Description	Mode	Mic	Chan	Lock N	Ratio Set	Gains I-II	Cond Limit
39	Fund X2	0	1	1	2	0.5253	2-15	Read
40	Oil Pump	0	1	1	2	0.0166	1-10	Read
41	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
42	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
43	Brg Swashplate 48 F1	0	1	1	2	0.0145	2-10	Read
44	F2	0	1	1	2	0.0137	2-10	Read
45	FB'	0	1	1	2	0.0107	3- 5	Read
46	3FB'	0	1	1	2	0.0325	3-15	Read
47	Brg Upper Rotor 37 F1	0	1	1	2	0.0032	1-20	Read
48	F2	0	1	1	2	0.0024	1-20	Read
49	FB'	0	1	1	2	0.0021	1-20	Read
50	3FB'	0	1	1	2	0.0062	2-15	Read
51	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
52	Brg Lower Rotor 39 F1	0	1	1	2	0.0043	1-20	Read
53	F2	0	1	1	2	0.0035	1-20	Read
54	FB'	0	1	1	2	0.0031	1-20	Read
55	3FB'	0	1	1	2	0.0112	2- 5	Read
56	Brg Input Quill 23 F1	0	1	1	2	0.1056	1-20	Read
57	F2	0	1	1	2	0.0736	2-20	Read
58	FB'	0	1	1	2	0.1133	2-25	Read
59	3FB'	0	1	1	2	0.3421	3-20	Read
60	Brg Tail Rotor 43 F1	0	1	1	2	0.0341	3-15	Read
61	F2	0	1	1	2	0.0217	2-15	Read
62	FB'	0	1	1	2	0.0203	2-15	Read
63	3FB'	0	1	1	2	0.0611	1-25	Read
64	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
65	Brg Rotor Lo Sp 36 F1	0	1	1	2	0.0072	2-15	Read
66	F2	0	1	1	2	0.0065	2-15	Read
67	FB'	0	1	1	2	0.0055	2-15	Read
68	3FB'	0	1	1	2	0.0210	2-15	Read
69	Brg Lower Input 41 F1	0	1	1	2	0.0365	0-15	Read
70	F2	0	1	1	2	0.0251	0-15	Read
71	FB'	0	1	1	2	0.0234	1-15	Read
72	3FB'	0	1	1	2	0.0722	2-20	Read

TABLE XXV. ACOUSTIC LOG SHEETS, UH-1D, ENGINE COMPONENTS, SONIC ANALYZER PROGRAM NO. 5250

Item No.	Component Description	Mode	Mic	Chan	Lock N	Ratio	Gains I II	Cond Limit
1	Start	0	0	0	1	0.0000	0- 0	Start
2	Clear	0	0	0	1	0.0000	0- 0	Clear
3	N1 Cal	0	0	0	1	0.3223	5- 5	Set Max
4	N2 Cal	0	0	0	2	0.3533	5- 5	Set Max
5	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
6	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
7	Mic No. 2 Norm	0	2	2	1	1.1223	5-25	Set 5
8	No. 2 Compr Fund	0	2	2	1	1.0000	3-10	Read
9	-Fr	0	2	2	1	0.7556	3-10	Read
10	+Fr	0	2	2	1	1.0222	3-10	Read
11	No. 1 Main Brg Fl	0	2	2	1	0.2142	2-20	Read
12	F2	0	2	2	1	0.1413	3-20	Read
13	Fb'	0	2	2	1	0.1420	3-20	Read
14	3Fb'	0	2	2	1	0.4462	4-20	Read
15	No. 1 Main Brg Opt Fl	0	2	2	1	0.2272	4-20	Read
16	F2	0	2	2	1	0.1506	4-20	Read
17	3Fb'	0	2	2	1	0.4444	4-20	Read
18	No. 2 Main Brg Fl	0	2	2	1	0.3155	5-15	Read
19	F2	0	2	2	1	0.2400	2-20	Read
20	Fb'	0	2	2	1	0.2210	5-15	Read
21	3Fb'	0	2	2	1	0.6631	1-25	Read
22	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
23	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
24	Mic No. 2 Norm	0	2	2	1	1.1223	5-25	Set 5
25	No. 2 Main Brg Opt Fl	0	2	2	1	0.2450	1-20	Read
26	Fb'	0	2	2	1	0.2146	2-20	Read
27	3Fb'	0	2	2	1	0.6463	1-25	Read
28	Oil Pump Vane 27	0	2	2	1	0.0137	0-15	Read
29	Oil Pump Gear 27	0	2	2	1	0.0355	5-15	Read
30	Fuel Cont Pump Gr 25	0	2	2	1	0.0370	5-20	Read
31	Fc Accy Dr Gr 26	0	2	2	1	0.0565	5-20	Read
32	FC Main Dr Gr 22-23-24	0	2	2	1	0.1352	3-20	Read
33	N1 Tach Dr Gr 6-7	0	2	2	1	0.1640	2-20	Read
34	Spur Idler Gr 4B-5-8	0	2	2	1	0.1742	2-20	Read
35	Fc Dr Gr 9-10	0	2	2	1	0.1772	2-20	Read
36	Bev Dr Gr Adgb 3-4A	0	2	2	1	0.3172	5-15	Read
37	Mic No. 2 Norm	0	2	2	1	1.1223	5-25	Set 5
38	No. 3 Main Brg Fl	0	2	2	2	0.3241	5-15	Read
39	F2	0	2	2	2	0.2451	5-15	Read
40	Fb'	0	2	2	2	0.2255	5-15	Read
41	3Fb'	0	2	2	2	0.7007	5-20	Read
42	No. 4 Main Brg Fl	0	2	2	2	0.2206	2-20	Read

TABLE XXV - Continued

Item No.	Component Description	Mode	Mic	Chan	Lock N	Ratio Set	Gains I-II	Cond Limit
43	F2	0	2	2	2	0.1444	3-20	Read
44	fB'	0	2	2	2	0.1451	3-20	Read
45	3Fb'	0	2	2	2	0.4574	4-20	Read
46	No. 4 Main Brg Opt F1	0	2	2	2	0.2341	5-15	Read
47	F2	0	2	2	2	0.1540	2-20	Read
48	3Fb'	0	2	2	2	0.4556	4-20	Read
49	Mic No. 2 Norm	0	2	2	1	1.1223	5-25	Set 5
50	Adgb Bev Dr Gr 7-8	0	2	2	2	0.1127	1-25	Read
51	Adgb Bev Dr Gr 9-10	0	2	2	2	0.1167	2-25	Read
52	Adgb Idler Gr 11-12-13	0	2	2	2	0.1644	2-25	Read
53	Output Lo Sp Gr 3-4	0	2	2	2	0.3022	4-15	Read
54	Output Hi Sp Gr 1-2	0	2	2	2	0.6141	2-20	Read

TABLE XXVI. ACOUSTIC LOG SHEETS, UH-1D, OTHER XMSN BEARINGS, SONIC ANALYZER PROGRAM NO. 5260

Item No.	Component Description	Mode	Mic	Chan	Lock N	Ratio Set	Gains I-II	Cond Limit
1	Start	0	0	0	1	0.0000	0- 0	Start
2	Clear	0	0	0	1	0.0000	0- 0	Clear
3	N1 Cal	0	0	0	1	0.3223	5- 5	Set Max
4	N2 Cal	0	0	0	2	0.3533	5- 5	Set Max
5	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
6	Lock Check	0	1	1	1	0.7333	5-10	Read Peg
7	Input Quill Sft Brg 24 F1	0	1	1	2	0.0641	5-15	Read
8	F2	0	1	1	2	0.0441	5-15	Read
9	FB'	0	1	1	2	0.1366	2-25	Read
10	Lower Trans Brg 40 F1	0	1	1	2	0.0331	2-15	Read
11	F2	0	1	1	2	0.0212	4-10	Read
12	FB'	0	1	1	2	0.0176	4-10	Read
13	3FB'	0	1	1	2	0.0573	3-20	Read
14	Lower Trans Brg 42 F1	0	1	1	2	0.0376	4-15	Read
15	F2	0	1	1	2	0.0257	4-10	Read
16	3FB'	0	1	1	2	0.0744	2-25	Read
17	Input Quill Sft Brg 25 F1	0	1	1	2	0.0527	2-20	Read
18	F2	0	1	1	2	0.0336	2-15	Read
19	3FB'	0	1	1	2	0.1161	2-25	Read
20	Mic No. 1 Norm	0	1	1	1	1.1223	5-25	Set 5
21	Brg 25 Opt F1	0	1	1	2	0.0474	2-20	Read
22	F2	0	1	1	2	0.0312	2-15	Read
23	3FB'	0	1	1	2	0.1147	2-25	Read
24	Main Bev Gr Brg 26 F2	0	1	1	2	0.0403	4-15	Read
25	FB'	0	1	1	2	0.0346	2-15	Read
26	3FB'	0	1	1	2	0.1263	2-25	Read
27	Brg 26 Opt FB'	0	1	1	2	0.0323	2-15	Read
28	3FB'	0	1	1	2	0.1171	2-25	Read
29	Main Bev Gr Brg 27 F2	0	1	1	2	0.0503	2-20	Read
30	3FB'	0	1	1	2	0.1415	2-25	Read
31	1st Stg Carrier Brg 34 F1	0	1	1	2	0.0264	4-10	Read
32	Lower Trans Brg 38 F1	0	1	1	2	0.1053	5-20	Read
33	F2	0	1	1	2	0.0766	5-25	Read
34	FB'	0	1	1	2	0.0670	3-20	Read
35	3FB'	0	1	1	2	0.2421	5-25	Read

CONCLUSIONS

1. Used with the revised limits provided in this report, the Curtiss Model CWEA-4 Sonic Analyzer should prove to be a successful tool for checking UH-1 component anomalies, especially in the main transmission and tail rotor areas.

2. The relatively low gain settings required for the transmission and tail rotor components are indicative of good strong working signals for these components.

3. The revised tapes should demand considerable respect when an anomaly is indicated and should result in an increased confidence level in the analyzer.

4. Several low-frequency and sideband checks proved to be troublesome and inconclusive, requiring some further work. This involved only about 7 of the 59 items checked on the transmission and tail rotor components.

5. The common module for all models of the UH-1 helicopters can be continued. Only the gain settings and the N_1 locking ratios differ.

6. In addition to defective parts causing high condition meter readings, there is evidence that misalignments, improper clearances, improper torquing, etc., can also cause high readings.

RECOMMENDATIONS

1. Field test the revised tapes, keeping maintenance and teardown inspection records on the aircraft tested for correlation with analyzer readings.

2. Consider a program with these tapes to investigate the effects on the various sonic signals of selected areas of misalignment, improper torquing, etc. Results could provide a means of determining whether a high condition meter reading was caused by a defective component or by misalignment, improper torquing, etc. The search would be for such clues as:

   a. Effective changes in background noise levels.

   b. Effective change in total energy of fundamental plus sidebands and/or harmonics due to increased operating pressures or vibrations caused by the misalignment.

   c. Effective changes in sonic signals for components in the immediate area and most likely to be affected by the particular misalignment.

3. Investigate noise levels for the entire frequency spectrum. The objective would be to improve performance by providing several reference normalizing noise levels for various frequency bands within the spectrum rather than the present one for the entire spectrum. At the same time, any drift in noise levels for various sample frequencies should be investigated.

4. Conduct another analysis of the 42° and 90° gearbox sideband data when a representative set of either UH-1B or UH-1D aircraft checks has been obtained with the revised tapes 5210 and 5240.

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13. ABSTRACT

The purpose of this program was to use additional data to update the original UH-1 aircraft sonic analyzer limits and to determine the advisability of using a common checking engine speed for all models.

The method involved a full engineering analysis of the original 1967 data plus an approximately equal amount of data obtained on UH-1 helicopters at Fort Eustis, Virginia, in 1968.

Emphasis was placed on selected transmission and tail rotor components, including the primary drive gears.

The work consisted of deleting invalid or questionable data by detailed investigation of component inspection records, maintenance records, rpm locking information, playbacks of recorded data, contradictory data, etc., in an effort to assure that only valid representative data was used for limits determination.

The need for two test tapes to handle all the various models of the UH-1 helicopter evolved from the analysis. The result is sonic analyzer limits for the UH-1 helicopter which should demand considerable respect as to the condition of the aircraft components. Any readings that exceed these limits in the future should not be passed off lightly, but rather should be seriously considered and investigated thoroughly.

DD FORM 1 NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

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14. KEY WORDS	LINK A		LINK B		LINK C	
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CWEA-4 Sonic Analyzer						
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Sonic Analyses - UH-1 Helicopter						
Sonic Analyses - T53 Turbojet Engine						